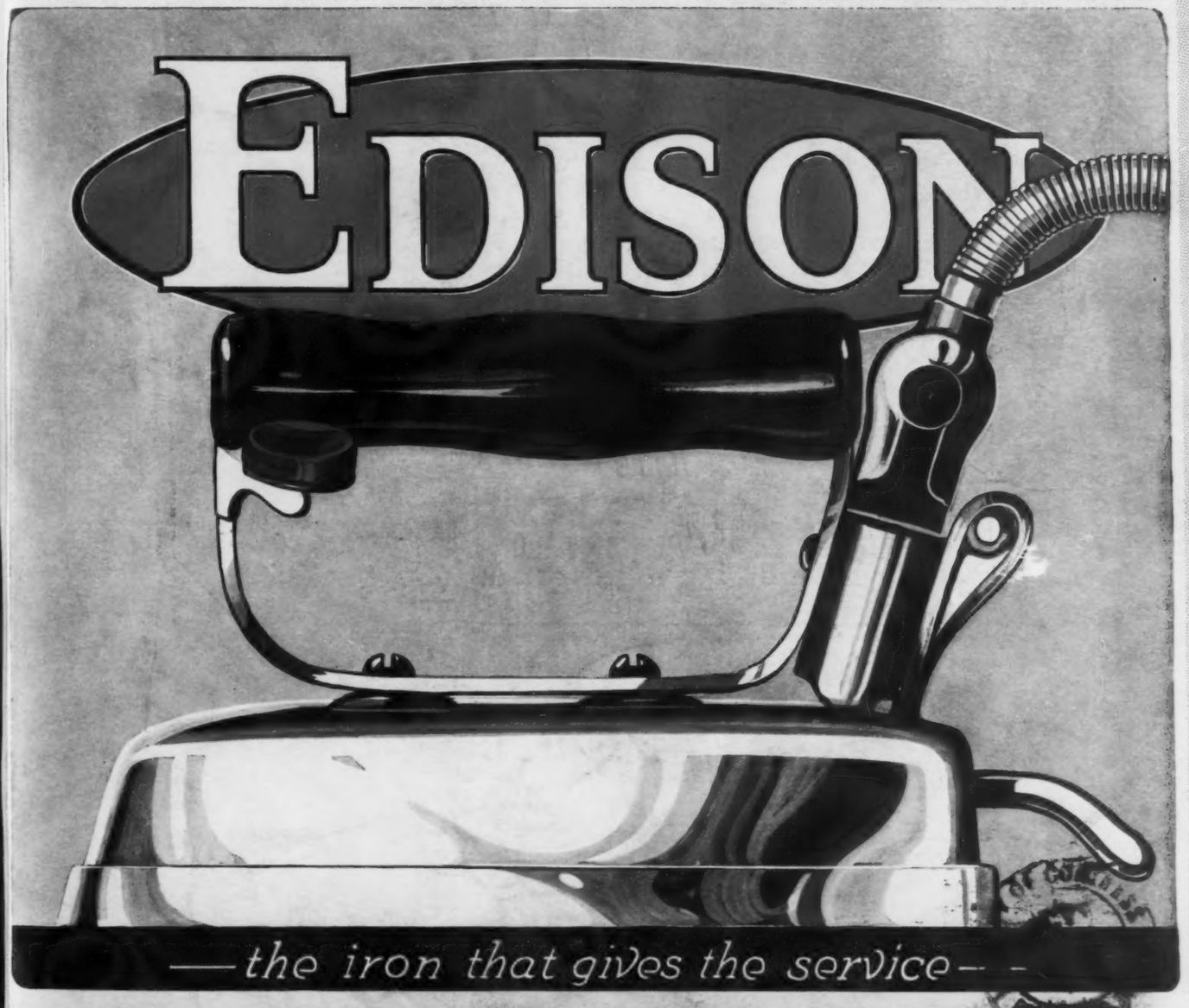
IN THIS ISSUE: New Electrical Advances in the Northwest

JOURNAL OF ELECTRICITY

Entered as second class matter Jan. 1, 1917, at the post office at San Francisco, under the Act of Congress, March 3, 1879. Published on the 1st and 15th of each month. Subscription rates in U. S., $2.50 per year.

Vol. 45, No. 7 SAN FRANCISCO, OCTOBER 1, 1920 Per Copy, 25 Cents



EDISON ELECTRIC APPLIANCE CO., Inc.
CHICAGO
New York Ontario, California Atlanta
Exclusive Distributors for the Pacific Coast
PACIFIC STATES ELECTRIC CO
San Francisco - Los Angeles - Seattle - Portland - Oakland - Spokane

"American Beauty"
ELECTRIC IRON

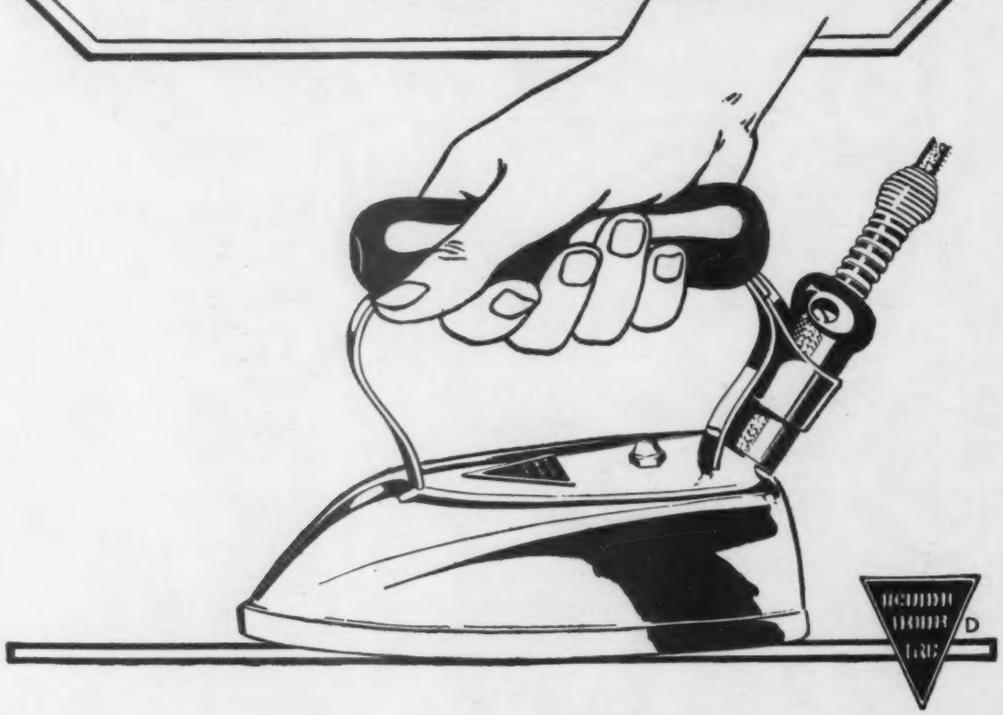
The best iron made

Always ready for use. No delayed ironings with *THIS* iron—no troublesome repairs to bother with. Its sturdy construction assures years of uninterrupted service. Of course it costs a little more at first, but is cheaper in the end.

Manufactured by

American Electrical Heater Company, Detroit.

Makers of a Complete Line of Electric Heating Devices.



JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor — H. W. L. GARDINER, Business Manager

VOLUME 45 — SAN FRANCISCO, OCTOBER 1, 1920 — NUMBER 7

Contents

EDITORIALS 303

A Call for the Principals—The Northwest Association—Economies in Arizona and New Mexico—The Boomerang of Fear Advertising—Report of Electric Railway Commission—Cooperation on Wiring Specifications—The Federated Engineering Societies—How Safe Is a Used Lap-Seam Boiler?—Boiler Code of the A. S. M. E.—A New Record in Interconnection—The Triumphant Electric Drive for Battleships.

THE OUTLOOK FOR THE ELECTRICAL INDUSTRY — by John B. Fisken 307

The major portion of the presidential address delivered at the Spokane convention of the Northwest Electric Light and Power Association, which includes a significant summary of the problems and advances of the electrical industry in the Northwest during the past year.

COMPETITION IN THE PUBLIC UTILITY INDUSTRY — by George L. Myers 310

A paper presented at the Spokane convention which discusses the tendency toward a monopolistic rather than a competitive system for public utilities under state regulation.

TECHNICAL SECTION'S REPORT TO THE CONVENTION 314

Data of considerable value to the central station is included in this report of the Technical Section of the Northwest Electric Light and Power Association, which deals with many practical problems encountered by Western power companies.

ACCOUNTING SECTION REPORT 317

That the accounting methods used are the basis of efficient cooperation in the electrical industry, is shown in a portion of the report presented to the Spokane convention by the Accounting Section of the Northwest Electric Light and Power Association.

COMMERCIAL SECTION REPORT 318

Part of a most constructive report dealing with the commercial side of the central station business as an important aspect of electrical activity is given here.

POLE PRESERVATION — by W. M. Leavitt 321

A Spokane convention paper which discusses the durability of poles and a new means of preservation as a factor directly affecting the electrical industry.

THE CONSTRUCTION OF THE GIBRALTAR DAM — by N. A. Bowers 325

An interesting account of how all difficulties were conquered and the Gibraltar Dam of the city of Santa Barbara, California, was finished on schedule time.

MORE POWER TO THE WEST — by Robert Sibley 328

The story of the great electrical empire of the West is briefly but strikingly told here with the aid of a number of graphic charts.

PAMPHLETS AND CLIPPINGS IN A BUSINESS LIBRARY — by Virginia Fairfax 330

The first of a series of articles which take up methods of handling the great quantities of valuable clippings and pamphlets which are accumulated in every office or industrial plant. This material may not be reprinted without written permission from the Journal of Electricity.

The Great Northwest—Frontispiece 302
Complete Registration Spokane Convention 319
Engineers of Yesterday—by A. L. Jordan 320
Reminiscences of Power Development on the San Joaquin—by A. G. Wishon 322
Progress of the Electrical Home Campaign 327
An Electrical Storm 331
Advertising—by Howard Angus 332
Mechanical Analogs—by G. R. Schuck 334
Western Ideas 335
Problem Course in Electricity—by H. H. Bliss 336
Wired Wireless 337
Sparks 338
Personals 339
Meeting Notices for Electrical Men 341
Happenings in the Industry 344
Latest in Everything Electrical 348
New Electrical Developments 349
Vacuum Cleaner 350

PUBLISHED SEMI-MONTHLY BY

McGRAW-HILL COMPANY, Inc., — Rialto Building — SAN FRANCISCO

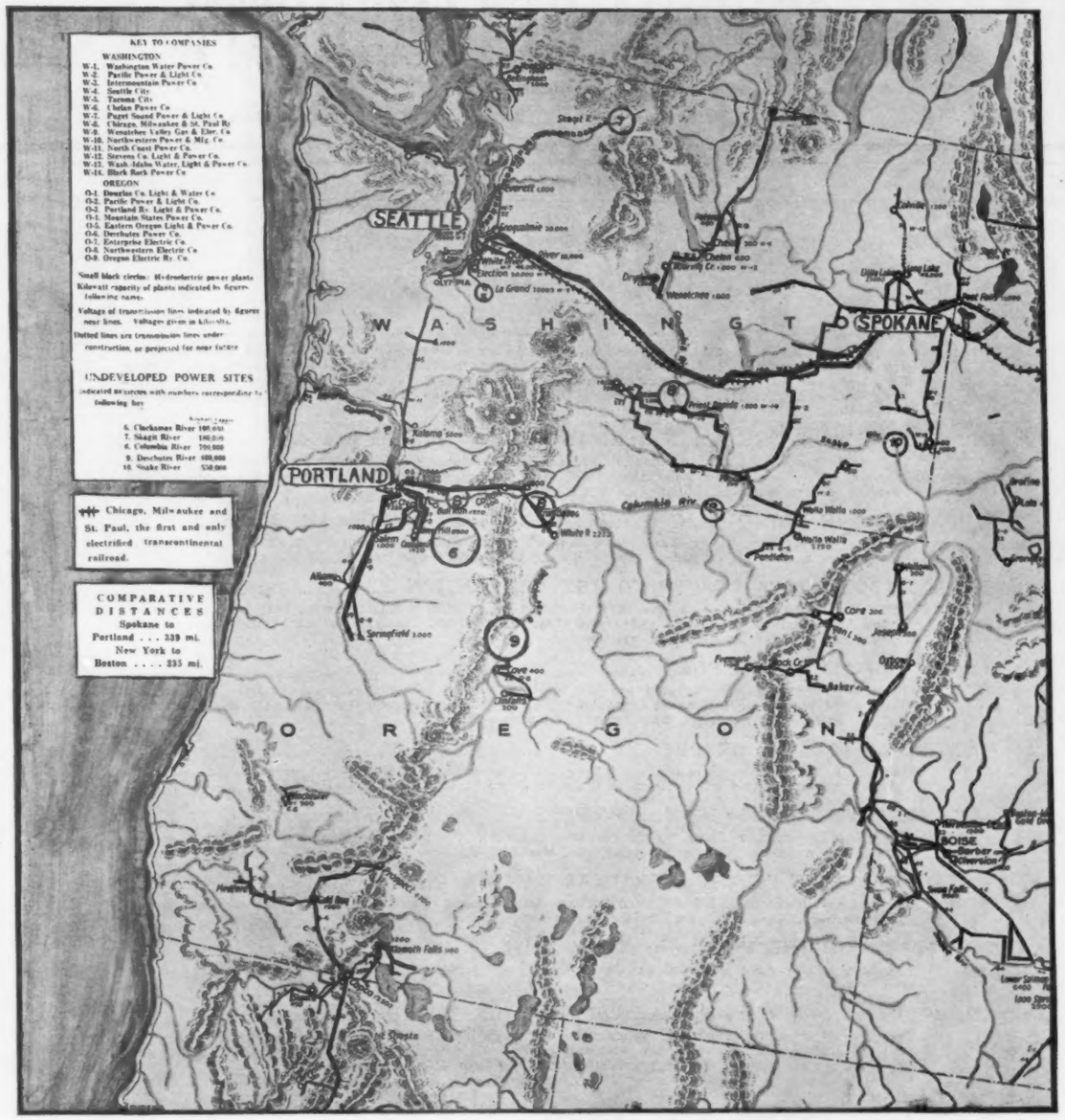
NEW YORK, Tenth Ave. at 36th St.
WASHINGTON, D. C., 610-611 Colorado Bldg.
CHICAGO, 1570 Old Colony Building
PHILADELPHIA, Real Estate Trust Building
ST. LOUIS, 713 Star Building
CLEVELAND, Leader-News Building
SAN FRANCISCO, Rialto Building
LONDON, E. C., 6 Bouverie St.
BUENOS AIRES, Calle Corrientes, 685

Publishers of
American Machinist
Electric Railway Journal
Engineering and Mining Journal
Power — Coal Age
Chemical and Metallurgical Engineering
Engineering News-Record
Ingenieria Internacional
and of
THE ELECTRICAL TRIO:
ELECTRICAL WORLD —— JOURNAL OF ELECTRICITY —— ELECTRICAL MERCHANDISING

Copyright, 1920, by McGraw-Hill Co., Inc.

Subscription Rates in United States, Mexico, Cuba, Porto Rico, Hawaii and Philippines, $2.50 per year. Canada, $3.25. Elsewhere, $4. Single copy, 25c. When change of address is required, both old and new addresses must be given. Notice must be received two weeks before change takes place.

Member Audit Bureau of Circulation


KEY TO COMPANIES
WASHINGTON
W-1. Washington Water Power Co.
W-2. Pacific Power & Light Co.
W-3. Intermountain Power Co.
W-4. Seattle City
W-5. Tacoma City
W-6. Chelan Power Co.
W-7. Puget Sound Power & Light Co.
W-8. Chicago, Milwaukee & St. Paul Ry.
W-9. Wenatchee Valley Gas & Elec. Co.
W-10. Northwestern Power & Mfg. Co.
W-11. North Coast Power Co.
W-12. Stevens Co. Light & Power Co.
W-13. Wash.-Idaho Water, Light & Power Co.
W-14. Black Rock Power Co.
OREGON
O-1. Douglas Co. Light & Water Co.
O-2. Pacific Power & Light Co.
O-3. Portland Ry. Light & Power Co.
O-4. Mountain States Power Co.
O-5. Eastern Oregon Light & Power Co.
O-6. Deschutes Power Co.
O-7. Enterprise Electric Co.
O-8. Northwestern Electric Co.
O-9. Oregon Electric Ry. Co.
Small black circles: Hydroelectric power plants
Kilowatt capacity of plants indicated by figures following name.
Voltage of transmission lines indicated by figures near lines. Voltages given in kilovolts.
Dotted lines are transmission lines under construction, or projected for near future
UNDEVELOPED POWER SITES
Indicated on map with numbers corresponding to following key
6. Clackamas River 100,000
7. Skagit River 100,000
8. Columbia River 700,000
9. Deschutes River 600,000
10. Snake River 550,000
Chicago, Milwaukee and St. Paul, the first and only electrified transcontinental railroad.
COMPARATIVE DISTANCES
Spokane to Portland . . . 339 mi.
New York to Boston . . . . 235 mi.
SEATTLE
PORTLAND
SPOKANE
BOISE
W A S H I N G T O N
O R E G O N

The Great Northwest Visualizes a New Adventure in Co-operation

The fact that the three commonwealths of California, Oregon and Washington hold within their boundaries practically 50 per cent of the undeveloped water powers of the nation lends added significance to the recent activities at the Spokane Convention of the Northwest Electric Light and Power Association, where central station men, contractor dealers, jobbers and manufacturers unanimously decided to establish a Cooperative League in Washington and Oregon similar to that now in operation in California. The power lines that traverse this vast district of our nation as shown above; the adventure and daring evinced in the accomplishment of the first trans-continental steam railroad electrification; and the industrial activity indicated by the fact that 25 per cent of the lumber production of the nation to-day comes from these two commonwealths, lead us to the conviction that once again the electrical industry is about to chronicle new and important advances in co-operative achievement.

OCT -9 1920 ©CLB479443

JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 45 SAN FRANCISCO, OCTOBER 1, 1920 Number 7

(Copyright, 1920, by McGraw-Hill Company, Inc.)

A CALL *for the* PRINCIPALS

THE public utility has been proud to proclaim its position as a public servant. In the intricacies of rate regulation and the issuing of securities in financing, the public utility commission nominally represents the public and adjudicates between the public and the utility. This is only an artificial distinction, however. With every action governed by public supervision and its entire existence predicated upon the degree to which it meets public needs, the public utility is as essentially a servant of the public as the commission itself.

With this broad definition and program of service, it is essential that all branches of power company activity stand out in the open with every opportunity for public inspection, welcoming publicity as public officials should welcome it who are responsible to the voters of the community. In general, this policy has been recognized by the power companies of the West and relations between these utilities and their respective districts are those of mutual respect. There is, however, one step farther to go. It is time that the financial interests which control the business affairs of public utility companies should stand forward with the same frankness as the managerial department.

The public is an investor in public utility securities; it is beginning to recognize that its welfare is dependent upon these electrical servants of its industry—and it is far from indifferent as to who shall have the direction of these elements in its prosperity. The directorate of public utility companies have too often stood in the background, holding meetings and determining policies behind closed doors and asking for public interest only when they have something to gain. The spirit in which the electrical industry is meeting the public today is on the whole one of the most broad-minded public service—a fact which is rightly its best guarantee of public favor and of permanent prosperity. The time has come to recognize that the director of a public utility should be not merely a good business man—he should be a man of broad public viewpoint, a fit exponent of the fundamental policies of his industry.

Let the shoe pinch where it may. The Journal of Electricity is proud to boast of utility activity throughout the West as of the highest order. Institute activities, N. E. L. A. organizations, and associations designed to promote service to the public need constantly that stimulus which encouragement at meetings by the presence of the principals themselves can alone give. Certain chief executives and a few of the directorate of these utilities have through untiring effort made the West stand out today as foremost in the nation in activities of this nature. The results speak for themselves.

But where are the others? The public in its day of reckoning will take cognizance of this status of affairs, as surely as it takes all other factors into account in its appraisal of its public utilities and their service.

The Northwest Association

While there have been in the past conventions of the Northwest Electric Light and Power Association more largely attended, a more lavish outlay of entertainment and perhaps a more brilliant array of central station talent represented on the program, it is, nevertheless, unquestionably true that the work of the Thirteenth Annual Convention of the Association in session during the past semi-monthly period at Spokane, Washington, will go down in history as one of the greatest accomplishments in the eventful years of the Association's history. Not only were technical problems of highest value to the industry in the Northwest brought out in papers and discussions; not only was the message of the industry presented in concise, tabulated form on charts to members present at the sessions, and carried in public lectures to the citizens of Spokane; but, more important than any other feature, the decision was made by this convention to undertake a Cooperative Campaign similar to the one now in such successful operation in California, on a basis that precludes any possibility of doubt in the hearts of its supporters as to its ultimate outcome and triumphant success.

Unquestionably this definite action taken by the Northwest Electric Light and Power Association setting in motion the cooperative movement which is to be known as the Northwest Electrical League is the most important step to be recorded by the electrical industry of the West in recent months. The action is well considered, coming as the result of a year's investigation, and is unanimously supported by contractor-dealers, jobbers, manufacturers and

---

J. B. FISKEN, consulting engineer, Washington Water Power Company —

"The clouds which have obscured the electrical industry during the past year have most of them a silver lining and the silver lining is beginning to show."

—Northwest Electric Light and Power Association.

power men alike. The new campaign is inaugurated at a time when the need for power company financing, as well as a growing interest on the part of the public in electrical comforts, make a concerted appeal for a better relationship between the customer and the electrical industry most timely.

The committee in presenting this plan have taken a stand for "merchandising at a profit" both on the part of the power company as well as the contractor-dealer. They stand for strengthening the contractor-dealer association by bringing in all retail elements and for a reciprocal plan of education which shall put new constructive ideas into immediate practice. As a result of these progressive policies, it is expected that the income to all branches of the industry will be definitely increased at the same time that the public is better served. In addition, the new league will act as the legislative and political guardian of electrical interests, and more than all else it will bring about a mutual understanding and serve as the practical expression of a fixed policy toward high standards in inter-industry relationships as well as toward the public.

The actual formation of a permanent committee and the details of financing are in the hands of the new executive committee of the Northwest Association, but the unanimous support already pledged by all branches concerned makes this merely a matter of detail in organization. The Northwest Electrical Service League is already in action.

Economies in Arizona and New Mexico

Electricity is seldom thought of as a by-product, but in the mines and mills of Arizona and New Mexico this is the fact. A large amount of the power generated in these states comes from utilizing the waste heat from the reverberatory furnaces used to reduce the low grade ores of that district. These huge furnaces are fired by Mexican oil or powdered coal, and the exhaust gases are passed through Stirling boilers and the steam used to drive turbo-generators. The electricity is then used in all stages of mining and milling the ore, from driving the air compressors which feed the drills to furnishing the power for the ore cars which carry away the pure metal. This economy has made possible the mining of lower grade ore than before which has increased the output of the district and added to its wealth.

The Boomerang of Fear Advertising

The public generally, ignorant of electricity and its laws, is more or less hesitant in adopting new and unused electrical things. Inherently a sense of fear prevails in the human mind regarding uses of electricity, and any appeal that is made to the sense of fear has a tendency to undo many good things that the electrical industry has been endeavoring to put over during recent years—namely, that of showing to the public the sane, safe and helpful influence that proper installations bring about rather than the awful disaster that may result should installations be improperly made.

The Journal of Electricity and its readers have long been upholders of safety devices and proper uses of electricity in the home, in agriculture and in industry; but we do believe that the utilization of electrical appliances and other devices of a safe character can be brought about without frightening the public into action through fear. Hence, we discountenance any advertising or any publicity matter that endeavors to drive its point home by leading its readers to take action through fear.

Report of Electric Railway Commission

The Federal Electric Railway Commission is to be congratulated upon the far-sightedness of the report which was recently made to President Wilson. The salient point of this report was that the street railways should serve the public at cost and be allowed a fixed return on their investment, the value of which should be determined by agreement. This plan of the Commission simply means that rides shall be furnished to the public at the lowest possible actual cost while the investor shall be guaranteed a fixed return on his holdings. When the given fare is found to produce profit above a fair return, the money should go neither to the company nor to the city, but be deflected back to the pockets of the public by an automatic reduction in the fare paid by the rider. Such a plan is palpably fair to both the public and to the investor, and has been used successfully in the operation of the street railroads in several of the larger cities of this country. This plan, if adopted, will make an investment in a public utility operating a street railroad system as safe as a savings bank with probably a slightly larger rate of interest being returned. Some such sweeping change as recommended by the Commission is what is needed to save this branch of the electrical industry from the bankruptcy and chaos which it faces today.

Cooperation on Wiring Specifications

The occasional wide divergence of bids on electrical wiring jobs is one of the elements which contributes most strongly to a distrust of the electrical contracting business. The electrical contractor, on the other hand, fairly contends that this confusion is not altogether, nor even largely, his fault. Plans made by architects and owners, unschooled in the technique of electricity, are usually inaccurate and unclear, and there is often so much confusion that a flat sum is sometimes frankly added to cover the item of misunderstandings. On this basis there can be no standardization.

The advisability of the electrical contractors and the mechanical and electrical engineers getting together in local sections throughout the West to consider the proper drawing up of wiring specifications was advocated in an editorial in the July 15th issue of the Journal of Electricity. Since that time a committee has been appointed by the California Association of Electrical Contractors and Dealers to

cooperate with the engineers along these lines and it remains now only for the local sections of the engineering societies to take similar action.

No action can, of course, be forced upon the public, but it is equally true that no step forward will be taken until a united industry has determined its course. The electrical contractors have taken a most constructive stand in advocating this measure and this opportunity for cooperation in the bettering of standards should not be overlooked by the engineers. It is to be hoped that the formation of engineering committees to consider this subject will be one of the first acts of the fall term.

The Federated Engineering Societies

The various conventions of the leading engineering societies of the country which have been held in different parts of the country within the past month have given an opportunity of presenting the proposition of a joint engineering organization to the main bodies of these societies. The reaction in the main has been favorable, definite action being taken in one or two cases and in others the question presented to the absent members for a written ballot.

In general, the balloting has disclosed the fact that the conservative element which is present in almost all organizations and which regrets any step beyond the purely technical interests of the engineer, is not widespread and that as a whole the membership of these societies is in favor of the broader viewpoint.

No selfishly narrow considerations should be permitted to stand in the way of this cooperative effort between engineers. As a matter of fact, no rights are subtracted from any one of the joining organizations and the new body's function is merely to add a means for influencing those elements in the lives of engineers and in public relationships in which the entire engineering profession has a common interest. At a time when the question of engineering compensation is competing in public interest with the compensation of all lines of workers, when the question of the licensing of engineers, already a fact in eleven states, is coming up this year again for consideration in several others, and when public matters of vital importance are demanding the expert advice which the engineering profession has to give, this movement for a coordinated stand of all engineers is of the utmost timeliness. Every other profession has its medium for united expression—the engineering group can no longer afford to lessen its influence by scattering its energies.

How Safe Is a Used Lap-Seam Boiler?

The question of the factor of safety to be used in determining safe working pressures for boilers other than those built to comply with the A. S. M. E. code and which have been for some years in operation, has been one fraught with considerable discussion in recent weeks in the West. It seems that the Boiler Revision Committee of the Industrial Accident Commission of California, holding hearings in San Francisco, proposes a factor of safety increasing with the actual use of the boiler. Some serious objections have been made to these factors by users of boilers and by second-hand dealers. It would appear evident that an increasing factor should be applied from year to year in proportion to the length of service of the boiler, and it is to be hoped that the objections will be cleared away in a friendly manner and the entire code put into operation at the earliest date possible, in order that this commonwealth may stand in its usual position, that of front rank in matters of progress towards safety and accident prevention.

Lap-seam construction has come in for the greatest amount of discussion. The attitude of the committee appears to be fair to the owners of lap-seam boilers within the state of California in that it proposes no change in safety factor on existing installations from those in force since Jan. 1, 1917. These boilers were purchased and installed in good faith, under the conditions of safety then generally known. But the committee seems to be unwilling to permit a prospective purchaser to buy and change the location of a lap-seam boiler which has already been in use, without applying a factor of safety which it believes reasonably safe for this type of construction. Eventually, the committee feels, the lap-seam construction must be displaced by a design that is free from the inherent defect known to boiler experts as "the typical lap-seam crack."

"Second-hand stationary boilers within the state of California on Oct. 1, 1920, by which is meant boilers where both ownership and location are changed, shall, if of lap-seam construction, have a factor of safety of at least six," says Sec. 381, a, of the proposed revision. Virtually identical installations in other communities show that the states of New York, New Jersey, and Pennsylvania require the same factor of at least six, while Ohio, Massachusetts and the city of Detroit will permit nothing under eight, except for boilers 36 inches in diameter or under, when the factor of safety is at least six. It would seem then that a factor of six could well stand, and that the objections urged against its adoption as being too high and as leading to prohibitive boiler practice should be overruled.

Boiler Code The A. S. M. E.

Unquestionably one of the most constructive pieces of engineering work ever undertaken by an engineering society is that of the boiler code of the American Society of Mechanical Engineers. This code goes into great detail as to how boilers should be properly constructed, the factors of safety involved in designing the boiler

---

GEO. L. MYERS, assistant to president, Pacific Power & Light Company —

"It is the obligation of power company and utility commission alike to safeguard the public and the dereliction of either does not excuse the other."

—Northwest Electric Light and Power Association.

and many other helpful and valuable rules for proper design and installation. Since the code was first promulgated in 1914, seventeen states and several cities, including Philadelphia, Detroit and Seattle, have adopted it as the official legal document for state inspection work. California has adopted the A. S. M. E. 1914 code as from Jan. 1, 1917, and the revised boiler safety orders propose to adopt the 1918 code. The California Industrial Accident Commission is to be congratulated on this forward step toward boiler safety.

A New Record in Interconnection

Once again a new world's record is to be soon accomplished in the West in the matter of interconnection of power service. The tie-in of the San Joaquin Light & Power Corporation's lines with the Pacific Gas & Electric Company's lines at Newman, California, has previously been alluded to in these columns. While this tie-in made possible a solid connection of copper from Oregon on the north to the Mexican border on the south, and thence up into Nevada, it has hitherto been recognized that the transference of power was only small. By the first of the year, however, this interconnection is to be reinforced so that a total of 12,500 kw. may be continuously transported over this connection to all parts of the vast empire served by these transmission lines. During the last year this company was a purchaser from the Southern California Edison Company to the extent of 78,000,000 kw-hr. Since the installation of its new power house, known as the Kerckhoff plant, the San Joaquin Light & Power Corporation has at its disposal during next year 160,000,000 kw-hr., this being figured on the basis of an 80 per cent power factor, a 90 per cent use factor and a utilization of 70 per cent of known law water supply of the San Joaquin river. The new tie-in with the Pacific Gas & Electric Company's system is to be accomplished by means of a 30-mile line from the Kerckhoff plant to Merced, Cal., over a 110,000-volt transmission line which is to be constructed with a capacity of 30,000 kw. The delivery of poles and the avoidance of car shortage and line material have been planned for, and it is confidently expected that the entire new work will be completed by Jan. 1. The means thus afforded for conveying a vast quantity of hydroelectric energy from one section of California in its extreme north to another section of California in the extreme south along the Mexican border almost overwhelms one with the future possibilities it opens up for interconnected systems serving the rich agricultural and industrial sections of the nation.

The Triumphant Electric Drive on Battleships

That the electrically equipped "New Mexico" should have outdistanced all competitors in the navy on the question of economy and indeed on many other counts of operating efficiency, comes as no surprise to those who have followed this type of application in the modern marine drive. It comes as a source of gratification to the West that fuel oil, which is a product in such vast quantities in this section of the nation, coupled with the electric drive, should have played such an important factor on board battleships bearing the names of Western states. The "California," now building at the Mare Island Navy Yard in California, is to be a sister ship to the "New Mexico," while the giant "Montana," the keel for which was laid only during the past few months at the Mare Island yard, will also have the electric drive improvements.

The New Searchlight Department

BEGINNING with this issue the Journal of Electricity inaugurates a new and helpful service for industrial activities throughout the West that can hardly be overestimated in value. At the present time no service is in existence for the Western states wherein the man without a position in engineering and industrial activity can possibly seek to find information regarding positions open, or the man who wants to employ trained men can turn to get lists of desirable men, nor is there a place where information can be had concerning used material in construction work on the Pacific Coast, either with a purpose of disposal or purchase. To date the Journal of Electricity is the only one of the McGraw-Hill family which has not inaugurated what is known as a "Searchlight Department" wherein all these matters may be completely attended to. The rates for doing this work have been made lower than the other types of advertising in the columns of the Journal of Electricity in order that the freest use may be made of this splendid new service by our readers throughout the West. It is believed that this will grow rapidly into a very comprehensive service for the industry, and readers and well wishers of the Journal of Electricity can help us beyond measure by following these items issue by issue, sending in to us inquiries to fill wants desired, and in every way boosting this new and unique service held in view by the Journal of Electricity, which issue by issue in the near future will be unfolded to our readers.

The Outlook for the Electrical Industry

BY JOHN B. FISKEN

(The most important problems now confronting the electrical industry were summarized in a striking way in the presidential address at the recent convention of the Northwest Electric Light and Power Association at Spokane, Wash. The address, quoted in part below, was delivered by John B. Fisken, consulting engineer for the Washington Water Power Company, at the close of his successful year of office as president of the Association.—The Editor.)

One of the clouds on our industrial horizon which has, so far as any visible evidence indicates, no silver lining, is that one representing taxes. The nation has an immense war debt to take care of and it will take years to get relief from that burden, but there are many ways in which some relief at least may be obtained nationally.

Taxation and a National Department of Public Works

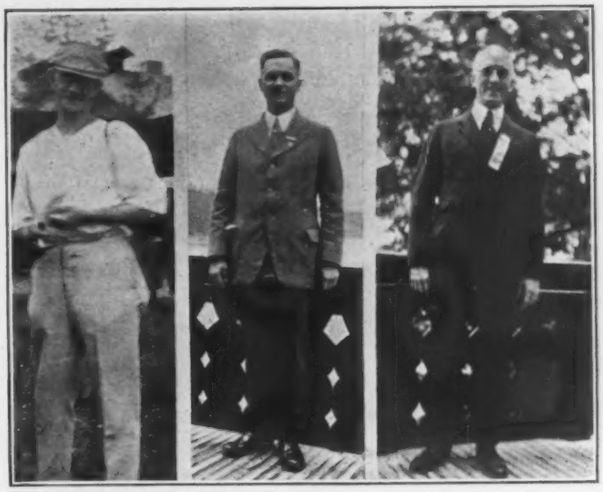
The engineering work of the Federal Government is scattered practically through every department and each department has its own corps of engineers whose work is done without any attempt at coordination with the work of any other department. Not only is there no attempt at either cooperation or coordination but in many cases the engineering staffs of several different departments are working on the same work not only without cooperation but actually in opposition to one another. A movement was started in the spring of 1919 to devise means of removing the unnecessary tax burden due to this anomalous situation, which resulted, in June of last year, in the introduction in the Senate by Senator Jones of Washington, and in the House by Congressman Reavis of Nebraska, of a bill to create a National Department of Public Works, which department would do practically all the engineering work for the government at a greatly lessened cost. In May of this year, the Chamber of Commerce of the United States took a referendum vote of its members which resulted in 827½ votes in favor of the measure and 549½ votes opposed. Our own national organization, the N. E. L. A., voted in favor of the measure. Is it not possible that our Public Policy Committee could do something to interest the Congressmen from our states in favor of these or any other measures that will lead to a reduction in the Federal taxation?

I have touched upon the inefficiency of the Federal Administration. Are our State Administrations any more efficient? Our State Public Policy Committees might well make a study of this question and if inefficiency is found to exist the facts could at least be furnished to our local stockholders and our customers; it might accomplish some good.

Increase in Rates

While the general outlook as regards the possibility of increasing our rates to meet our increasing expenses was not very favorable a year ago, the situation during the year has markedly improved. It may be that the public have come to a realization of the fact that a broken-down, bankrupt utility is a liability to the community, whereas a prosperous utility is an asset of great value. Be that as it may, it begins to appear that the regulatory commissions, after about twenty years of catering to the public demand for lower rates irrespective of the cost, a demand urged by cheap politicians who adopted this method of playing to the galleries in order to secure a few votes, have come to a realization of the fact that the building up and development of the country is more dependent upon the ability of the utilities to furnish the services required than on anything else.

The advocates of municipal ownership, comparatively few in number, are still groping in darkness and are ignorant of, or refuse to acknowledge the fact that the ownership of privately owned utilities does not rest entirely with a few men of great wealth but as a matter of fact is scattered through the homes of almost every self-respecting citizen of the country. Some of the stock is owned directly but a very large part of the ownership of the utilities is indirect. Insurance companies and banks own liens on utilities and in some cases large blocks of stock, so that most men who carry insurance or have bank accounts are in some measure dependent upon the continued and successful operation of privately owned utilities.



On the left John B. Fisken, consulting engineer for the Washington Water Power Company, who, being Scotch, was at home both in the president's chair and on the golf links. To his able planning and tactful presiding much of the success of the convention was due. W. M. Hamilton (center) of the Portland Railway Light & Power Company presented the important paper of the convention of public utility management, and is here shown ready for the "action" he recommends. W. E. Coman at the right, general manager of the Washington Water Power Company, whose broad-minded policy has done so much to promote good feeling in the electrical industry in the Northwest, is here exemplifying the pleasant greeting extended by Spokane to the visitors at convention.

W. R. PUTNAM, general manager, Idaho Power Company —

"Public utility commissions can only keep one step ahead of public opinion—the cooperative league will be a medium for the education of the public."

—Northwest Electric Light and Power Association.

CONVERTED TO COOPERATION. DELEGATES WHO ATTENDED THE CONVENTION OF THE NORTHWEST ELECTRIC LIGHT

Regulation of Utilities

Attempts are being made to revert to the practice of the regulation of utilities by cities and towns, counties, school districts and all the various municipal subdivisions of a state instead of by the state itself.

The basic idea based on experience throughout the country, that the utilities doing business in more than one city or bringing power for distribution in a city from a point or points outside cannot satisfactorily to themselves or the public have their rate-making and operation controlled by other than a competent state commission, whose vision will not be limited by any city boundary but who can and will regulate the utility for benefit both to its stockholders and to the public which it serves, influenced the Chicago Association of Commerce to oppose the attempt which the City Council of Chicago made early in the year to secure the exclusive power to regulate the rates of public utilities operating therein.

It will not do for us to sit back complacently and allow this cloud to grow. I know from talking with intelligent, right thinking men that the situation is not understood by the layman as it should be, and our Association should use all its powers of education to enlighten the large majority of the citizens on this subject.

Financing Extensions

The necessity exists today in many localities for much increased facilities for furnishing electric service, perhaps not to as great an extent in the territory embraced in our Association as in our neighboring state of California. President Edgerton of the Railroad Commission, who is surely fully qualified to know whereof he speaks, stated at Pasadena that very large sums are and will be required by the utilities in California to enable them to furnish the service demanded by the people of his state. He said:

> "I started in with $250,000,000 in the next ten years, and I have been raised now to $500,000,000; and I don't know where it is going to end."

At the same convention Past President Ballard made the statement that "the industry needs approximately $750,000,000 of new capital right now to care for the expanded requirements of the country."

The Investment Bankers' Association of America in its annual report issued last winter says, relative to the electric light and power industry:

> "It should not be difficult to educate the public to renewed and increasing confidence in an industry which has proved itself, even in the crisis of war, so stable, so resourceful, resilient and productive, and which offers convincing promise for safe and remunerative capital."

And the Board of Governors of the Association, after a series of conferences between their representatives and Executive Manager Aylesworth and a special committee of the National Electric Light Association, passed a resolution which stated that the following steps should be taken to restore the credit of the utilities:

> "1. Term franchises should be superseded by indeterminate permits securing the right to operate under proper regulation during good behavior with provisions for equitable adjustment of rates from time to time, as tending to eliminate controversies which inevitably impair the public service, the credit of the companies involved and the value of their securities.
>
> "2. The power of regulation and control of public utilities should be vested in state commissions as tending towards standardization of regulation which is not possible under local regulation.
>
> "3. Members of state commissions should be appointed. If commissioners are elected they are frequently embarrassed by political policies and platforms in the consideration of questions which should be decided only on sound economic and financial principles."

The August N. E. L. A. Bulletin stated that copies of this resolution had been forwarded to all members of Congress, to all state regulatory bodies, to all officers of all states, and to the mayors of the larger cities throughout the country. Copies have also been sent to Rotary Clubs. It remains for our Association through its Public Policy Committees and its Public Relations Section to spread the doctrine still farther and to follow up the suggestions by every means in its power.

The National Association and the Geographic Section

The National Electric Light Association, of which our Association is a geographic division or section, enjoyed for many years a calm and undisturbed repose. Some few years ago its slumber

AND POWER ASSOCIATION AT SPOKANE, SEPTEMBER 8-11, 1920, AND ADOPTED A PLAN OF COOPERATION IN THE INDUSTRY.

began to be disturbed, whether due to nightmares taking the form of phantoms of western activities or not I cannot say. At its annual convention last year a Western man, R. H. Ballard of Los Angeles, stepped into the presidential chair and almost immediately the slumbering giant yawned, stretched itself and awakened; that it will ever be permitted to slumber again is, to my way of thinking, extremely improbable.

The keynotes to President Ballard's administration were decentralization of activities and efficient service to members.

Owing to the organization of geographic divisions by the National Association it became necessary for us to amend our constitution. A special meeting was held at which Article I was amended so as to eliminate British Columbia and include Utah. I have endeavored to arrange for the re-inclusion of British Columbia in our territory, but possibly on account of the long distance between here and New York, I have nothing favorable to report on this situation. The British Columbia companies would, I have reason to believe, welcome the change, but the Canadian Electrical Association opposes it largely, as I am given to understand, for political purposes. I am sure we would more than gladly welcome our Canadian friends into our membership and I would urge that the matter be not allowed to drop.

Service to Member Companies

President Gille in his address last year suggested the advisability of our Association having a secretary who would give his entire time to the office. He suggested as future activities which could be undertaken, if this was done, industrial research for developing industries employing electricity as a motive power and cooperation with civic and other associations to that end; keeping member companies informed in all matters relating to rates; having a representative attend rate hearings before the Public Service Commission, to furnish data and assist in working out rate problems. My experience during the past year leads me to endorse very heartily Mr. Gille's suggestions. I would go further, however. I believe this Association should furnish service to its member companies, especially to the smaller companies which do not have on their staff men trained to cope with the various problems as they arise. This could be done by having the secretary visit the companies and find out what their troubles are and through the different sections get to them a solution of their difficulties.

Public Relations Section

One of the important functions of the Public Relations section will be to educate the public; to bring to the public a very large measure of realization of what the utilities really contribute to its welfare, apart entirely from the service furnished to it individually, and to cause it to give its whole-hearted endorsement to the growing tendency among the far-seeing regulatory commissions to assist in the development of the country by permitting the utilities to charge such rates for their service as will return a reasonable dividend to their stockholders on their investment. Among other means which have been proposed to accomplish the desired result is that of the formation of state committees composed of representatives of all privately owned utilities of whatsoever nature operating in the state. Such committees have been organized and are accomplishing good results in Illinois, Indiana, Kentucky, Ohio and Nebraska, and will probably be organized in Iowa, Wisconsin and Texas.

The utilities in Illinois were the first to take up this work and have established a program which will undoubtedly be followed in other states.

An Expression of Appreciation

No address at this time would be complete without containing an expression of appreciation of the helpful interest in our industry displayed by the Technical Press, and while invidious comparisons are never in order nor in good taste, I do not think I will draw any criticism when I refer specifically to our own Western magazine, the Journal of Electricity—long may it prosper.

W. M. MEACHAM, Meacham and Babcock, Seattle —

"Each branch of the industry is working along parallel lines—the cooperative league will be the binding cord which keeps this work in harmony."

—Northwest Electric Light and Power Association.

Competition in the Public Utility Industry

BY GEORGE L. MYERS

(That the economy of effort and resources inherent in monopoly should point towards a monopolistic rather than a competitive system for public utilities under state regulation, is strongly brought out in the following paper presented at the recent convention of the Northwest Electric Light and Power Association at Spokane, by the assistant to the president of the Pacific Power & Light Company.—The Editor.)

The principal concern of the user of any form of public utility service is the assurance of efficient service and at rates consistent with the quality of the service rendered. From economic and political standpoints the consumer's interests demand the establishment and adjustment of conditions from time to time which will best assure the permanency of these essentials. Until recently the public generally relied to a large extent upon competition as an important factor in securing these results. How greatly that confidence was misplaced is a matter of record to all familiar with the history of these enterprises, but it does not follow that the consuming public generally even now fully realizes the fallacy of relying upon competition as a means of protecting its interest.

Competition has been generally regarded as essential to our economic system—as a means of natural regulation of price and as the necessary incentive to industrial progress. Monopoly has been looked upon as obnoxious and not to be tolerated. It may easily become intolerable and indefensible if unrestrained and unregulated. The power to work its will arbitrarily in economic control of any of the pursuits of enterprise must be met by the sovereign power of political control. Self-interest and self-preservation from the public's standpoint demand that it be subject to effective government regulation.

Normal and Abnormal Monopoly

The development of industry from the old order of small scale production by the individual or partnership to the new order of large scale production by the corporation has brought about more efficiency and economy and great economic power. We cannot wisely because of fear of such power allow ourselves to destroy the economic gain of this new order. This gain may be fully preserved and the public amply protected by the application of recognized powers of government supervision.

Where monopoly is the result of natural development, or is a condition natural to a particular industry, common sense dictates that this condition be compelled to serve the public welfare. Where monopoly is attributable to unfair practices and methods, and is not essential or beneficial to the public interest, it is our duty to provide legislation and regulation that will restore and maintain the free play of competition. We should be able to distinguish the natural from the unnatural and, with this distinction made, to apply the appropriate political treatment. There has been a growing recognition of the fact that the interests of the people may be injured as well as benefited by competition. It is for this reason that monopoly is being recognized as a natural condition in the public utility industry.

Competition in public utility service has not been the rule, but the exception. Thus the general condition has been one of monopoly within the territory served by the average utility. It was because of this preferential economic situation, where the privilege to do business generally became exclusive in practice, that regulation became established as a governmental policy. The sporadic or occasional abuses and corruptions of old time managements and disregard for public rights and sentiment were the effects of unrestrained, uncontrolled and unregulated monopoly. Regulation to the extent of control of service, rates and accounts and determination of values and return in any industry is defensible only under conditions of monopoly.

Reasons For Public Utility Monopoly

The reasons why monopoly is generally prevalent in the public utility industry are the cost and physical fixity of the investment, the obligation to meet all reasonable demands for service, and the limitations of the market and its normally slow development, which latter condition affords a volume of business that is generally not sufficient to maintain competitive conditions.

The money invested in a public utility is usually greater than that of any other single enterprise in the average city and community. Large amounts must be spent for physical property of a fixed and immobile nature, which cannot be taken up and moved elsewhere, except at great expense, and much of it not at all. If it becomes useless for the purpose it serves it has only a negligible value. The fact that the investment is so large and is not mobile or convertible serves to discourage competition. The mobility and convertibility of the average industrial plant encourages competition, because the risk is less. The investment is less. The earnings on the capital invested are much greater because there is a quicker turnover. This makes amortization possible within a reasonable period under normal conditions. The public utility with its restricted earning power under regulation cannot fully amortize its investment. The average ratio of investment to income and the competition of other means of power make it impossible even without regulation to do it. Figures and experience under normal conditions disclose that for every dollar of new annual revenue to an electric utility a capital expenditure of $5.00 must be made. Particularly is this true in the West, where the volume of available business is relatively small and rates to encourage development necessary.

The ordinary industrial enterprise is not subject to the market limitations of the public utility. The latter is confined to the territory served. The former can reach the world. The market of the

public utility is of average slow development under limitations. In the ordinary enterprise it is what the productive genius and sales enterprise make it.

Capital investment of large amount, with large fixed charges, restricted return, immobile and limited in scope and development of market naturally tends to establish monopoly. Capital investment of quick prospective turnover, unregulated in return, mobile, and without such limitations in market, tends to maintain competition.

Monopoly can be accepted as a condition only where the circumstances make it possible to regulate to the extent of fixing prices. This is possible where values can be fairly determined and service based upon cost and a return sufficient to attract capital for investment and to compensate it for the risks undertaken and the skill, efficiency and economy of its management. The variable conditions in industry as a whole do not permit of price regulation. The volume of production, the extent of demand, the incentive to profit, the competition of substitutes and other economic ramifications regulate.

To sustain the contention that "the general condition has been one of monopoly within the territory served by the average utility" an investigation has been made of conditions of competition in the states within Association territory, namely, Idaho, Montana, Oregon, Utah and Washington.

The following is a table setting forth the number of communities that have electrical service and the number where the condition is one of monopoly and of competition, with a segregation where competition prevails as between municipal and private utilities:

State	Communities Served	Monopoly	Competition	Municipal	Private
Idaho	149	147	1	1	
Montana	122	122	0		
Oregon	191	190	1		1
Utah	188	180	8	2	6
Washington	275	268	7	5	2
Total	925	907	17	8	9

The United States Government in its operation of the postal system does not and would not tolerate competition. No city that operates its own utilities would do so. The Federal Government would use every honorable means to prevent the construction of another canal across the Isthmus to protect its tremendous investment in the Panama Canal, because competition would increase materially the burdens of taxation. Already a realization of the wasted efficiency and capital in competitive facilities for railroad transportation has brought about a large and growing sentiment for a recognition of the advantages of monopoly and the necessity for a larger measure of Federal control, which a greater concentration and centralization of management and direction in some regional plan would serve to simplify. The user of the service of competitive telephone systems keenly feels the added burdens of service in two or more bills instead of one if all users of telephone service are to be reached.

Special Responsibilities in Public Utility Service

A public utility is chartered by government. It is vested with the sovereign power to take private property for its use even without the consent of the owner. The acceptance of this sovereign power operates to dedicate its property to public use. This power obligates it to render a public service, adequate and without discrimination and at reasonable charges. The grant of this power and the generally exclusive exercise of it justifies and necessitates an exercise of the sovereign power of the state or its agent to see that the obligation is fulfilled. That there has been recognition of the fact that this obligation can be met with greater economy and benefit to the consumer by monopoly is evidenced by the legislative acts of 23 states of the Union that empower their commissions to permit or deny competition by the grant or refusal of a certificate that the public convenience and necessity are subserved or met thereby. Public utilities are regulated in 37 states. In more than a majority, or 62 per cent, there is regulation of competition. Twelve of these states provide that the power of their commissions shall include municipalities. This shows the extent to which this principle has become rooted in the political and economic life of some of the states. Public utilities in such states are not to become subject without cause to the unfair competition of municipalities, with their exemption from taxes and ability to draw upon the resources of the community, even those of their competitor, to make up deficits through taxation.

The following is a table setting forth states where regulation of competition prevails, showing the extent of such regulation as to private and municipal utilities:

States	Private Utilities	Municipal Utilities	States	Private Utilities	Municipal Utilities
Arizona	Yes	No	Nevada	Yes	No
Arkansas	Yes	Yes	New Hampshire	Yes	No
California	Yes	No	New Jersey	Yes	No
Colorado	Yes	Yes	New York	Yes	Yes
Idaho	Yes	No	Oregon	Yes	No
Illinois	Yes	No	Pennsylvania	Yes	Yes
Indiana	Yes	Yes	Tennessee	Yes	No
Kansas	Yes	No	Utah	Yes	Yes
Maine	Yes	Yes	Vermont	Yes	Yes
Maryland*	Yes	Yes	Wisconsin	Yes	Yes
Massachusetts	Yes	Yes	Wyoming	Yes	Yes
Missouri	Yes	No			

*City of Baltimore excepted.

NOTE.—The fourteen states other than those listed above where there is regulation of public utilities are Alabama, Connecticut, Georgia, Michigan, Montana, North Carolina, North Dakota, Ohio, Oklahoma, Rhode Island, South Carolina, Virginia, Washington, and West Virginia.

The Railroad Commissions of Iowa and Nebraska have certain jurisdiction over construction, operation and maintenance of electric transmission lines, and in Nebraska over capitalization. There is regulation in the District of Columbia and the territories of Hawaii and Porto Rico and the Philippine Islands. In Porto Rico and the District of Columbia there is control of competition applicable to both private and municipal utilities.

Destructive Competition

The Railroad Commission of California has established a policy of holding out the threat of potential competition as a penalty for failure to give adequate service. Let us take a hypothetical case. An existing public utility fails to give adequate service. Another public utility applies to the Commission for the privilege to enter. The Commission determines

---

ROBERT SIBLEY, editor Journal of Electricity—

"Every branch of the industry is concerned in the success of the central station—and the new direction of cooperative effort is toward the marketing of power company securities."

—Northwest Electric Light and Power Association.

upon investigation that the existing utility has failed in its obligation to give adequate service. Predicated upon this finding the Commission must grant the right to enter. A competitive warfare ensues. Each utility has a certain endurance to withstand competition. Neither can sell its service at a loss and continue to do it. Neither the state nor the city can give either an advantage through regulation or legislation. One of three conditions will result—combination, confiscation or an understanding. Combination, because neither is disposed to play a losing game by keeping the available revenue divided; confiscation. because the utility of greater resources has survived the weaker; or an understanding because each has come to an agreement that it is better to maintain a parity of rates and let each live by asking for the necessary relief in added revenue that will permit each to earn a fair return. In any event a duplication of facilities for service has resulted. If either combination or an understanding prevails rates necessarily must be increased to pay a return upon the invested capital. If the investment of one has been entirely wiped out the monopolistic condition has been restored and the capital of the loser wasted. It may be the utility it was sought to punish that has lost or it may be the utility that was to administer the punishment. The consumers suffer directly in the case of combination or an understanding and indirectly, at least, in the event of confiscation. Capital cannot be wasted without economic loss. The threat of competition may have its value as an assurance of adequate service, but it is questionable whether the necessity to carry it out is of greater value to the public than the risk of economic loss or waste.

Commissions have almost unlimited powers of regulation and should perform their full duty, and it would seem to be the policy of greater wisdom to fearlessly and vigorously enforce the power to control the conditions of service by compelling adequate service, either by the grant of the necessary revenue to do it where necessary or by compelling negligent management to conform to acceptable standards of service.

Wasteful Duplication of Service

Does competition render a service to consumers in respect to rates and development? If the return for capital invested is to be limited to a reasonable one upon a determinable value, competition can regulate rates downward until the limit of the endurance test of competition has been reached. Nothing can be sold indefinitely at less than a profit. A loss cannot be constantly sustained. Therefore, competition cannot be a permanent condition and regulate rates. Sooner or later the revenue must be made to yield at least a reasonable return. If the revenue is divided and the facilities of service are duplicated, obviously the revenue to yield that return must be obtained through increased rates. Whether competition nominally still exists the policy of live and let live must prevail.

When the fact is taken into consideration that the price of service is governed by the volume of the output sold it can be readily understood that any division of the volume necessarily means more must be paid for each unit of service. The extent to which the investment is duplicated by competition proportionately increases the fixed charges and there is an increase in expenses of operation and maintenance, together with taxes, which would not have to be borne by the consumers of service if the service were free from competition. Hence, the consumer benefits to the extent that the ratio of volume of output sold to the investment can be increased.

Capital used to provide duplicated facilities of service cannot be used to add to the facilities of service and increase development. The revenues foregone to survive competition make it more difficult and thus more costly to meet the demands and need for development. The resources of the new utility are largely spent to take as much as possible of the profitable business of the old utility, which restricts the ability of the latter to finance new developments. Capital is naturally timid. Its risks must be compensated. Without competition the capital takes the form of an investment and with it that of the speculative must be taken. Freedom from competition more nearly assures the security of the principal and a constant reasonable return for its use. Competition jeopardizes both principal and return. Development is therefore retarded.

Dangers of Speculation

Where the opportunity for competition has been left open irrespective of conditions the speculator has oftentimes victimized the developer and operator. Either the threat or actual state of competition has compelled the operator to purchase the property of the speculator as a legitimate measure of protection to the investment. Vicious advantage has been taken of the larger companies because of the adverse influence that a competitive condition, even of minor proportions, has upon the estimate of the prospective investor as to the stability of the investment. The prospective investor, not having an intimate knowledge of the actual condition of the property and its soundness, necessarily magnifies its importance even though unjustified. It is much easier for the investor to be alarmed than assured. He is naturally obsessed with more skepticism than confidence. The mere presence of competition reflects adversely upon the financing of a property as a whole. The investor does not know to what extent it may grow. It has not infrequently occurred that possession of an undeveloped water power for the available possible output of which there was no real economic demand or need has been used as a speculation because of its possibilities in potential competition. The speculator has not only demanded its market value, but has included a nuisance value as well, as the price of non-interference with the service of the bona fide operator. Such practices are of economic injury and the morals of such a speculator are those of the holdup artist. Regulation of competition by protecting and encouraging development prevents and discourages vicious speculation.

Competition of Modern Improvements

Absolute prohibition of competition would be inconsistent with the public interest. The unforeseen developments in the arts and science and in the processes of our economic life make it necessary that competition should be possible—that the justice and wisdom of its existence must be determined from the variable facts and conditions in each case by the judgment of fair men under the law as an administrative act and not made impossible as an act of legislation. The possible development of new facilities or resources in the inevitable march of progress makes it necessary and desirable that there should be opportunity to allow competition, when, in the judgment of properly constituted authorities, the fact is clearly established that the proposed competition represents a permanent advance in service over the existing utility.

The horse-car as a means of transportation had to give way to the electric car and the electric car may have to give way to the motor vehicle. No one of these means of transportation can be protected from the competition of air craft. The operation of a water line cannot be denied because it competes with a rail system. Nor can the competition of motor vehicles over our increasing mileage of improved highways. The electric utility could not expect protection from the gas utility and vice versa. Each utility has its characteristics and possibilities for greater service. All that the existing utility may properly demand in such a case is that the proposed competitor be required to furnish as complete and adequate a service and under comparable burdens and obligations to the public. However, opportunity should be given to earn enough to meet the reasonably anticipated needs of obsolescence by adequate amortization to meet new developments within the industry that are discernible and to obviate the necessity wherever possible of competition.

While it is true that under conditions of economic restraint only there is no obligation to protect or preserve an investment that progress has made of no real economic value, nevertheless, under conditions of regulation as practiced there is a moral obligation to see that a public utility has the opportunity to protect itself in the return of its capital.

The Inevitability of Progress

There has been argument that not to leave competition absolutely free will serve to discourage use of improved facilities developed in the arts and science and that inventive genius will be discouraged. Competition has been very much the exception and if the future is to be judged by the past this argument is not tenable. It is within the power of regulatory authorities to compel utilities to give service in keeping with modern methods. Manifestly, under regulation it is as much the duty of regulatory authorities to enforce modern standards of service as it is the obligation of the utility to use and apply them. Incompetence and neglect by either does not absolve or excuse the other. Both have a public trust to perform and respect.

However, the pressure of demand upon available means of supply will have a most desirable influence toward the use and exercise of modern means and practices.

Regulation that has an eye to the service of the public utility in economic development and progress generally will offer inducement to use improved facilities and methods by making it possible for some equitable distribution to be made between the management and its patrons of the profits from what is saved.

Furthermore, improved facilities and equipment that make for the economy and conservation of electrical energy are the products of the manufacturers of appliances and equipment. It is inconceivable that those for whose use they are designed and perfected can discourage their manufacture. It is the business of the manufacturer constantly to promote and develop improved processes. They will see to it that these improved processes are brought to public recognition and their use made inevitable.

It is the purpose of our Federal patent laws to foster and encourage invention and you cannot stifle the irrepressible spirit of the geniuses that bring them into recognition and use. It is impossible to defeat the purpose and results of applied knowledge. The unseen and inexorable laws of natural progress are impregnable to such artificial forces as may endeavor to challenge them.

The Economical Use of Capital

At no time in the history of the world has there been greater need for intelligent, efficient and economical use of capital. We have just passed through a period of war on a vastly greater scale of destruction than at any other time in history. We have produced to destroy. Now we must produce to build.

Our progress is largely dependent upon the use that we make of capital. If we use it intelligently, efficiently and economically we can produce more, and if we produce more and maintain the purchasing power of the producer we can live better. Our needs and comforts will be more amply supplied and we will reach a higher standard of living conditions. Thus the morale of our people will be strengthened and the improved quality of our citizenship will give us greater economic, social and political stability. Capital and the efforts of labor should not be wastefully or inefficiently utilized or expended if the greatest possible service is to be rendered.

Equitable Regulation

Therefore, the industry that is so regulated that return is limited should be kept free from competition if the facilities of production and distribution are identical in order to conserve capital for its greater economic use. What has been invested and what will be invested in competitive public utility enterprises of identical nature may not be of an

---

W. H. ONKEN, JR., editor Electrical World —

"The best protection against competition is the complete service of the community by the original company."

—Northwest Electric Light and Power Association.

amount to appreciably influence the cost of money to the industry. However, the need to conserve capital and put it to the best use is not a problem of degree. It is possible to do it where the condition is one of natural monopoly and capable of such regulation as to fix charges and standards of service.

Regulation is correct in principle and should be made fair in practice—fair to the public and fair to the investor. If the principle in practice is to determine the conditions of service, character of rates, the fair value of property for purposes of rate-making and the reasonableness of return, is there not an obligation, in some measure at least, to protect the investment? Assuming that the purpose of the law is met by providing a reasonable return upon a fair value, is it unreasonable to ask that if these limitations are to be prescribed the industry be protected from competition? It is as wasteful and as foolish to allow competition under regulation as it is to allow two men to drive the same nail. There is only one nail to be driven just as there is but one public utility service of identical nature to be rendered. There is a duplication of labor and capital to drive the one nail and a duplication of capital and labor to furnish the one kind of service. Regulation in the sense of control of public utilities as exercised is in truth uneconomic. It leaves no opportunity for economic law to be free to regulate. It is a denial of the efficacy of competition as a regulator of rates and service.

Regulation is a task of large undertaking. Its problems are many and perplexing. Anything that can be done to simplify regulation will make it more efficient and successful. For this reason if the complexities of competitive situations are eliminated the purposes and objects of regulation can be better served and achieved.

Technical Section's Report to the Convention

(In the one year's time during which this Section of the Northwest Electric Light and Power Association has been in existence remarkable results have been achieved. Acting through its own membership and that of the National Committee, it has gathered data which should be of vital interest to the central station utilities of the Northwest.—The Editor.)

The Governing Committee of the Hydroelectric and Technical Section of the Northwest Electric Light and Power Association has summarized in a complete manner the reports of the various Committees of this Section as presented at this, its first convention. At the same time the Committee traced some of the steps in the evolution of the Association work up to the present time.

Even though the Section has been in existence only a year, the Committees have proved themselves to be of inestimable value. Working through their own membership and with the Committees of the National Association, the problems and experiences of the country have been brought to the Northwest and, through membership in the National Committees, the problems and experiences of the Northwest have been given to the country at large.

ELECTRICAL APPARATUS

Progress in standardization has required the closest cooperation between the manufacturer of electrical apparatus and the user, and it depends upon their combined ingenuity and experience. Probably the most important point of contact today between the manufacturer and the user is that existing between the Power Club and the Electrical Apparatus Committee of the N. E. L. A. And the Association's committee is rendering a service of no small value to the National Committee. The report takes up in detail the experience and practice of various member companies in connection with twenty different subjects, enumerated below:

Experience with and Application of Reactors.—The use of reactors has been more general in the East than in this part of the country, it being applied more in the case of stations running over 10,000 kilowatts, but they are coming into more common use yearly.

Grounding of Neutrals of Generator Windings.—One company reports that it does not ground the neutrals of its generators, but in the case of two other companies it seems to have been beneficial.

Generator Field and Armature Failures.—Not many cases of failures are reported considering the number of machines and the length of time covered, but the explanations for such failures are of great interest.

Unsatisfactory Results From Varnished Cambric Station Cables.—The use of such cable seems to have been generally satisfactory.

Experience with 600-Volt Synchronous Converters.—Most of the experience with synchronous converters in the Northwest has been with 600-volt railway apparatus, and the experience of the different companies is of a great deal of interest. The experience of the Portland Railway, Light & Power Company in changing from 33 to 60 cycles is particularly worthy of note.

Relative Advantages and Fire Hazards of Air-Blast and Oil-Cooled Transformers.—There seems to have been only one case of fire in large oil-cooled transformers, while several cases of fire in air-blast are reported. It would seem that the preference would lie in favor of the oil-cooled, even though from the insurance companies' standpoint the fire hazard is greater.

Induction Regulator Failures and Character of Regulator Installations.—Few failures are reported and the causes for these failures have been largely remedied in later designs of this type of apparatus. The feeling that any special protection for such equipment as is proposed by the National Electrical Safety Code of the United States Bureau of Standards is unnecessary seems to be general.

Standardization of Best Arrangement of Generating and Sub-Station Bus- and Oil-Switch Structures.—It would appear that this is desirable and that the construction should be as rugged and as open as possible.

Excitation System.—Both individual exciters mounted on generator shaft and combination waterwheel and induction motor-driven exciters are being used with satisfactory results.

Transformer Purchase Specifications.—Not much expression of opinion has been given us on this point.

Oil Switch Failures.—Apparently this trouble has been of serious nature and we would call attention to the desirability of further investigation for the reasons for such failures as well as the standardization of ratings.

Tendency Towards and Development of Automatic or Semi-Automatic Sub-Stations.—This is a development with which our companies have had little experience but it is significant that they are being seriously considered.

Experience with Iron and Copper Cooling Coils.—With the exception of one company, copper coils are generally recommended, particularly on account of the tendency for iron coils to choke with deposits of impure water, it sometimes having been necessary to flush them several times each day.

Standardized Transformer Polarity.—This should be adopted.

Use of Warren Clocks in Maintaining Frequency.—None of our companies report the use of such devices, and it would seem difficult here on account of the distance apart of the generating stations.

Standardization of Transformer and Switch Oils and Tests for Same.—This is recommended.

Advantages of Separate Control Batteries in 250-Volt D.C. Sub-Stations.—If emergency batteries are not present it is our opinion that separate control batteries should be installed in all stations where switches and apparatus are electrically controlled.

Locking of High Tension Bus and Switch Compartments.—This seems to be unnecessary, as no unauthorized persons are supposed to enter rooms containing same under our State Safety Rules.

Sub-Station Fire Fighting Equipment.—All sub-stations should be provided with such equipment. Dry sand is a great assistance in this particular.

Use of Wireless Telephone and Telegraph.—One company has used this with very good results. The outcome of the experiment which is now being tried in the East, viz., telephoning over high voltage lines carrying current, is being watched with interest.

In the discussion which followed, M. T. Crawford said that cable troubles reported by the Puget Sound Power & Light Company had been due to having lightning arresters on the plant side of the cable; they have been placed on the line side with better results. Mr. Lindsay urged the study of oil-switch problems. He brought out that Western plants had reached the capacity of the switches manufactured at present, and that there was needed either new types of switches or a sectionalizing of lines to avoid disastrous explosions in the future.

METERS

While the average engineer probably will not agree to it, the commercial man will say that the most important class of equipment on the central station system is the meter. Of the dozen or so men in the Northwest who are competent to discuss the technical phases of metering, some of them are on the Committee on Meters, part of the report of which follows. Improvement in present methods of measuring demand and in metering practice generally is the goal at which this committee has been earnestly working.

More active participation by men in the Northwest with the work of the National Committee on Meters has been effected, and much data has been compiled and forwarded to the chairman of that committee, in the report of which it has been embodied.

Considerable interest was manifested in connection with the supply of a sufficient number of properly trained meter men, and a committee has prepared a course of study which may be followed to equip young men. Discussion brought out the good results already gained from this education in accuracy, lack of labor troubles and the chance for advancement.

The section of the meter code for maximum demand meters was completed during the year and now is known as Section 10. It is recommended that those in charge of meter departments of this Association study this section of the code carefully as it will better enable them to secure the device for more nearly giving them the desired results where the demand of a certain type of installation is required.

It has long been recognized that a considerable saving of time and less liability of error would result from the adoption of standard disk constants. Manufacturers have agreed to the desirability of a change, and as soon as manufacturing conditions warrant it is expected that these will be put into effect.

Outdoor metering at moderately high potentials is becoming a common custom in the West, but the results of manufacturers in their attempts to meet the situation have not been entirely satisfactory. Without doubt, more study on the subject will bring about suitable standards.

The importance of the consumer's demand is being given more consideration for rate making and distribution purposes, with special reference to the smaller consumers. Considerable progress has been made by manufacturers of demand and graphic meters during the year past and the importance of studying power-factor recording devices was urged by Mr. Gille in the discussion that followed. The committee is looking for still greater developments of a simplified demand meter from the producers, when power companies shall have arrived at a proper rate for their service.

PRIME MOVERS

It is generally recognized that this Association is more deeply interested in water than in steam as a prime mover, and as the appointment of the Northwestern Committee took place so late in the year, it refers its Association to the report of the National Committee on Prime Movers, a great part of which refers to steam generation.

With the formation of the Hydraulic Power Committee of the National Association at Pasadena this year, because of the predominance of water power in the West, this Association will be well represented in its personnel.

INDUCTIVE INTERFERENCE

In view of the fact that few physical problems confronting the light and power utilities of this country are more important than the inductive interference problem, the committee has gone to great length in assisting the National Committee to formulate a nation-wide plan of action which will produce a basis on which to handle this question, interest in which is becoming so active among power distributing companies and communication companies. Close cooperation has been offered by the telegraph and telephone companies which are informing themselves

---

D. I. CONE, Pacific Telephone & Telegraph Company, San Francisco —

"It is a good sign when both communication interests and power companies are studying inductive interference as a general problem rather than as a series of special cases."

—Northwest Electric Light and Power Association.

with admirable thoroughness on every phase of the interference problem.

The deplorable situation of the power companies is reflected in the requests for advice received by the committee in specific Interference cases. These reveal the immediate need for formulation of governing principles by which the merits of each case can be measured and upon which a consistent policy can gradually be developed for the guidance of the power companies. An important feature in the National situation is the growing activity of state commissions in the matter of rules to govern inductive interference.

Among the principal things thus far accomplished by the National Committee are:

I. Establishment of contact with all parts of the country, and organization.
II. A first draft of governing principles (not yet complete).
III. Accumulation of a large amount of data.
IV. Establishment of a consulting relation with member companies.
V. The initiation of joint work with the sub-committee of the A. I. E. E. that is investigating the so-called telephone interference factor.
VI. The establishment by the N. E. L. A., at the committee's request, of a technical staff, and partial formulation of a program for technical work.

The West has a representation of nearly one-third on the National Committee.

Since July of this year, a few first principles have been deduced which could be considered sufficiently evident and established to warrant tentative adoption. The report outlines those in full and brings out some conclusions resulting therefrom.

There is already available a large amount of material of a technical, statistical, bibliographical and legal nature, to which considerably more will be added as it becomes available, to form an encyclopedic collection with analyses and summaries in three appendices. It is further proposed to present the more essential material in the form of a data book to meet the needs of the average power engineer.

Several cases of interference are presented in connection with the consulting relations work, which work will be difficult until a code of basic principles has been adopted.

A modification of the present wave shape standard for the no-load wave shape of synchronous machinery is being considered, to be known as the Telephone Interference Factor (t.i.f.). The method of measurement of this t.i.f. is given in the report, and other data concerning it.

To meet the requirements of the situation, as revealed by the first year's work of the committee, the executives of the Association, acting upon the committee's recommendation, have retained the services of W. J. Canada and Frank F. Fowle. Mr. Canada has immediate supervision of the technical work undertaken by the committee, and Mr. Fowle will act in a consulting engineering capacity. While the Technical Staff will carry on the active work, it will maintain close contact with and work in conjunction with the committee.

It is not the intention that extensive engineering research work be taken up this year, since this would involve the construction of an experimental parallel, which would have to be at least eight miles in length, corresponding to the standard transposition and loading sections of the A. T. & T. Co.

Under Mr. Canada's direction, work along definite lines is now being initiated, and the report outlines the procedure.

OVERHEAD SYSTEMS

With 34 per cent of the total investment of property in overhead systems, the problems and costs incident to the operation and maintenance of overhead lines has been extensively studied by the Association's Committee and presented in detail in the report of the National Committee. Construction methods and materials, maintenance methods and materials, insulator maintenance — these are the three topics on which questionnaires brought forth such a splendid response from the companies.

Maintenance of alive wires has been given much thought, and several companies returned full reports on this question. The Committee treated in an exhaustive manner the preservative treatment of poles and crossarms, but apparently no settled opinions exist among the companies as to either preservative or process. It was brought out, however, that merely the painting of the pole did not prolong its life. In the discussion on cross-arms treatment, it was decided to be merely a matter of climate.

Following up pole protection in the discussion, Mr. Fisken recommended the Harding method of reinforced concrete around the pole. He also said that his company burned off the weeds from around the pole once a year. Mr. Boykin reported good results by using waste products from garages for killing weeds.

In the matter of insulator resistance, reference is made to the report of the National Committee. The Overhead Committee is working through the Safety Committee in an endeavor to cooperate with the Bureau of Standards, particularly in the redrafting of part 2 of the Code. Loading and strength requirements of pole construction require further consideration, although results of the survey demonstrate to the Committee that even the 1916 Code would be exceedingly difficult to comply with, much less the more rigid conditions proposed in the suggested changes.

The Washington Electrical Construction Statute, it was shown, would compel over a million dollars in cost of changes if it should be permitted to go into effect in July, 1922. Its dangers were pointed out in the discussion, and its retroactive effect. All effort is to be made to have the act repealed before the next session of the legislature of that state.

An exhaustive program has been laid out by the Committee in conjunction with the national body, and because of its large representation in that body, the Northwest has been kept well advised of activities affecting overhead work.

UNDERGROUND CONSTRUCTION AND ELECTROLYSIS

The promise of better cables and their more intelligent use by the utilities is one result of the work of the Committee in the completion of cable

specifications which followed investigations of dielectric losses, etc. While underground construction in the Northwest is at present confined to a few of the larger companies, still it is becoming more common, especially in submarine crossings and for building entrances.

Especial interest is manifested in safe operating temperatures for cables, because nearly all power companies are facing increased load conditions that demand working cables to their ultimate limit or purchasing new cable equipment. Results are being secured toward better and more reliable cable to meet the occasional overloads. In particular, manufacturer measurement of dielectric power loss per foot and the power factor of the charging current are covered in the new specifications.

The report takes up I^2R losses and dielectric losses, direct practice, potheads and junction boxes and practice in finding of faults. In the discussion, Mr. Le Fever gave the figures of some cable tests which showed more unsatisfactory results with varnished cambric than with paper insulation.

SAFETY RULES

Activity in the matter of regulations to promote safety in the central station industry is still confined almost entirely to the revision of the 1916 edition of the National Electrical Safety Code of the Bureau of Standards. The only notable exception is found in California, where the power companies have brought out a code independent of the Bureau. It is reported that this code has been accepted by the Railroad Commission of California and will soon go into effect. As a result of this action in California, there is reason to believe that certain modifications will be made in the National Electrical Safety Code which will make it more acceptable to power interests generally.

The Committee has watched closely the monotonous progress of the code, and has stood firmly against the upward revision which is proposed in some of the rules. In connection with the Electrical Construction Statute of Washington, to the Public Policy Committee for Washington has been assigned the responsibility for taking suitable action. The Committee believes that the best solution will be found in the repeal of the act and the promulgation in its stead of the National Electrical Safety Code (with certain modifications) by the Public Service Commission.

Of the objectionable features, a limiting voltage to ground, changed from 5000 to 2900 volts, for supply lines crossing telephone circuits, where stronger construction was specified; an increase in the transverse loading specifications for grades B and C construction, and an increase from No. 8 to No. 6 in minimum sizes of medium and hard drawn bare copper wire allowable for grades A and B, carried particular weight. The result of a survey on these matters by the National Safety Committee and the Bureau was conclusive proof to the former that a revision upward in the requirements was entirely unjustified. The report embodies a recent letter from W. J. Canada to the Bureau of Standards outlining commendation of the revisions as a whole while presenting objections to the three rules referred to above.

In the final analysis, the Committee believes that the 1920 edition of the National Electrical Safety Code will, in general, be less drastic than the 1916 edition, with the exception of the three rules previously mentioned. It has certainly been very much simplified in arrangement and clarified as to intent. In its present form, with a few modifications, it could well be used as a basis for a Safety Code which would be workable and not unduly burdensome to the utilities.

ACCOUNTING SECTION REPORT

(Efficient cooperation in the electrical industry is considerably dependent upon the accounting methods used, and their coordination. Following is a part of the report made to the recent convention of the Northwest Electric Light and Power Association by the governing committee of the Accounting Section. —The Editor.)

In this report the committee on statistics and accounts of the National Association of Railway and Utilities Commissioners will be designated the National Committee.

It is our belief that the present intention of the National Committee is to submit such form of classification as it may devise to the various state commissions for approval before rendering its final report to the National Association for adoption. In our opinion, consideration of the National Committee's classification will be facilitated and better results obtained if territorial groups of the various states, similar to that of the Northwest Conference on Public Utility Statistics and Accounts, be effected. We therefore recommend that the National Committee make an effort to have such organizations or conference formed.

In its employment of the idea of uniformity of accounts the National Committee should extend this principle to include corresponding uniformity and standardization of annual report forms and statistical data required.

The titles and arrangement of primary or control accounts are of minor importance as compared with the great advantages to be gained by uniformity. It is assumed that in any event a classification will be devised along modern utility accounting lines, having due regard for the requirements of the various commissions as regulatory bodies and the requirements of the utilities as operating and financial organizations.

The test accompanying any classification proposed should be definite and exact. It is important that uniformity in text as well as in account be secured.

GEO. E. QUINAN, chief electrical engineer, Puget Sound Power & Light Company —

"Most problems are feared only because not understood. If the power company faces a difficult situation in inductive interference, it is time to learn all that can be known about it."

—Northwest Electric Light and Power Association.

It is our belief that it will not be necessary to devise an entirely new and original classification. Several exhaustive studies have recently been made along this line; these should be utilized so far as practicable, to the end that the work of the National Committee be minimized and presentation of a classification for the consideration of the several states be expedited.

Where practicable, the classification prescribed by the Interstate Commerce Commission, as representing a classification in general use by states and certain utilities should be followed. This recommendation is offered, having in mind that developments in accounting practice may make radical departures from the Interstate Commerce Commission's classification desirable in certain instances. We deem it important to obtain reconciliation between Interstate Commerce Commission balance sheet accounts and those to be prescribed by the National Committee.

The preparation of a Uniform Classification of Accounts is now in the hands of a committee of The National Association of Railway and Public Utility Commissioners, The National Electric Light Association and the American Gas Association, and it is our information and belief that the same will be completed so as to make possible its adoption by January 1, 1921.

Accounting departments have advanced to an important place in the affairs of our industry and we are quite sure that within a comparatively short time our profession can refer with much satisfaction to the rapid development made by the Accounting Section of the Northwest Electric Light and Power Association.

J. S. Simpson, Chairman, A. N. Cudworth, R. D. Shepherd, J. F. Denison, G. F. Nevins, C. F. Kirchhaine, A. E. Jannsen, A. B. Doerr, L. W. Dick.

Commercial Section Report

(The commercial side of the central station business constitutes an important field in electrical activities as developed today. A part of the constructive report, presented at the convention of the Northwest Electric Light and Power Association by the governing committee of the Commercial Section, is quoted below.—The Editor.)

Under the new plan providing for the organization of the membership of this Association into four major groups or sections, the Governing Committee of the Commercial Section, comprising nine members, appointed by the president last December, held two regular meetings besides carrying on considerable correspondence regarding matters of more or less interest to the Section and Association.

Undoubtedly the need for commercial emphasis in the central station business fully justifies the creation of a Commercial Section, to say nothing of the value of this arrangement in tying in with the similar plan of the N. E. L. A. parent body.

There is no question but that the central stations of this geographic district have been conspicuously progressive in the development of their business, still it is the opinion of this committee that a greater number of subjects could with profit receive more painstaking consideration in the future than has been the case in the past.

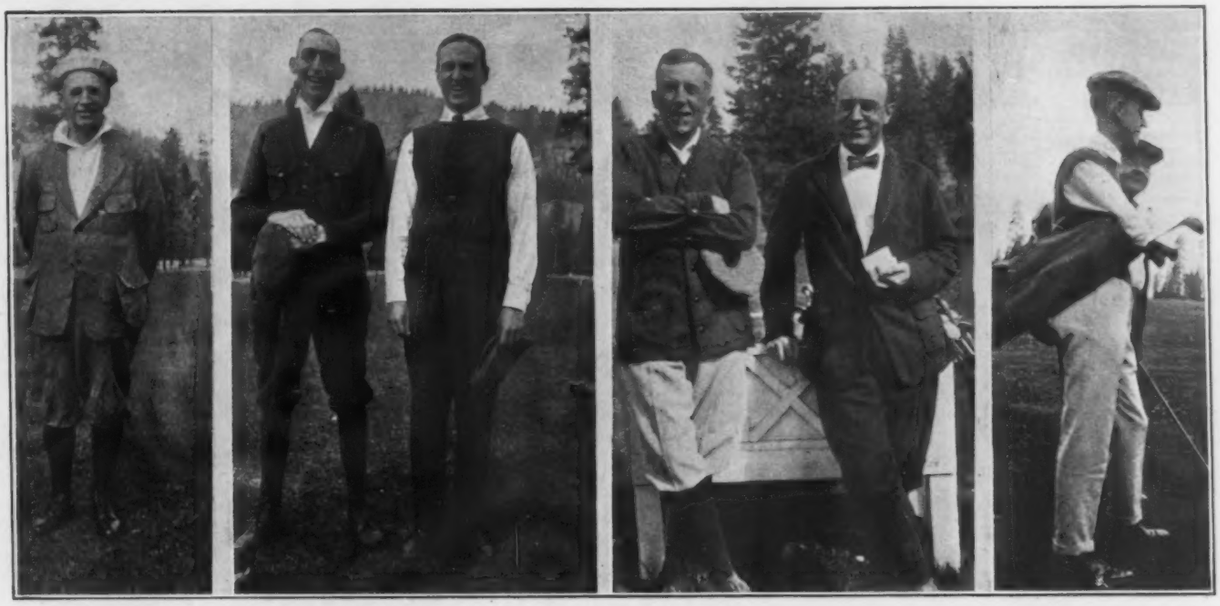
Among the outstanding things which should obviously be placed to the fore for early consideration are power factor rates, improvement in lighting sales, commercial service and relation with customers, electrical salesman's hand book and electrical vehicles; but in particular we wish to call attention to the importance of broad and constructive interest in the matter of an educational committee for practically all classes of our employes, as we feel that our business has grown in dimensions and importance to such an extent that those of us engaged in its various activities do not realize its scope. The development of trained talent for a continued and successful career in this vocation has not kept pace with the demands of the industry to date, and certainly the supply will not be adequate to meet future requirements.

We are of the opinion that a reasonable amount of expense, if necessary, would be justified in providing central facilities for the coordination of this information for the use of the membership of this Northwest territory, where the problems embraced in our business are in many respects distinctly different from those elsewhere.

The following matters appear to us to be of sufficient importance to be made the subject of special investigation and compilation:

1. Data as to comparative costs of competitive or substitutive forms of service.
2. Methods employed in all departments of our business which have proven to be successful in promoting a higher degree of efficiency.
3. Rate increases that have been secured and theories that have been successfully advanced in the efforts that have been made to secure increases.
4. Ways and means that have been adopted whereby gratuitous service has been eliminated and revenues have thereby been increased.
5. Educational campaigns that have been conducted with particular reference to revenues either through a decrease in operating expenses or an increase in charges.
6. Campaigns for the sale of securities among our customers.
7. General method of establishing demand where the rates are based on the demand.
8. General policy towards the furnishing of special transformers for special devices.
9. Line of demarkation that should be established between transmission line and distribution line, with special reference to the maximum voltage at which company should be prepared to furnish service to rural consumers at standard rates adjacent to the line.
10. Whether new customers requesting service at this time should pay an increased cost over what is paid by the old customers. This question is predicated on the fact that customers must be made to realize that increased use of utility service involves increased costs for many years to come.
11. Data as to abolishing costs between different classes of service so that all our central stations will have a better understanding of the costs of the main types of service such as power, residence lighting, commercial lighting, street lighting, cooking and water heating.

The above have been informally selected from the many things of a like nature the Committee has had under consideration and no doubt any reasonably well versed central station man could make from



At the extreme left is W. D. McDonald, Seattle representative of the Westinghouse Electric & Manufacturing Company. No, we don't know what he has behind his back. The uproarious gentlemen in the second picture are A. C. McMicken, sales manager for the Portland Railway Light & Power Company, and J. I. Colwell, Western Electric Company, Seattle. The photographer asked them to look pleasant.

The contented expressions of the leaning gentlemen are typical of how people felt at convention. The owners of these particular specimens are W. R. Putnam, vice-president of the Idaho Power Company, and H. L. Bargion of the Washington Electric Supply Company, Spokane. Markham Cheever, extreme right, chief engineer of the Utah Power & Light Company, looks like a man of one idea, but made able contributions to the technical discussions as well as to the golf contest.

twenty-five to fifty additions embracing matters upon which we need additional practical information, all of these being matters that are common to most of the companies and in connection with which we are ambitious to establish uniform practice as a fundamental necessity in order to render the most satisfactory and efficient service to the public.

In closing this report it is desired to state that as over half the members of this Committee were members of the Advisory Committee on the cooperation of electrical interests, this latter report was given the right of way and completed for presentation at this convention.

It is our belief that the plan submitted for cooperation, if adopted, will provide the machinery whereby all of the electrical interests such as dealers, contractors and manufacturers, will be able to cooperate with the central stations to the fullest extent and will result in a long step forward in the attainment of the highest ideals of electric service as a whole to the public.

J. V. Strange, Pacific Power & Light Co., Portland; A. C. McMicken, Portland Railway Light & Power Co., Portland; J. S. Groo, Northwest Electric Co., Portland; W. R. Putnam, Idaho Power Co., Boise; J. Ryan Gaul, Montana Power Co., Butte; R. F. Bailey, Utah Power & Light Co., Salt Lake City; J. F. Farquhar, Washington Water Power Co., Spokane; C. P. Cull, West Coast Utilities Co., Seattle; R. W. Clark, Puget Sound Power & Light Co., Seattle, Chairman.

COMPLETE REGISTRATION SPOKANE CONVENTION

Allen, S. S., Wash. Water Power Co., Garfield, Wash.
Allison, F. D., Wash. Water Power Co., Spokane, Wash.
Anderson, H. R., Wash. Water Power Co., Spokane, Wash.
Arthur, Guy, Arthur Fowler Co., Spokane, Wash.
Aspinwall, C. V., Westinghouse Elec. & Mfg. Co., Spokane, Wash.
Baily, B. P., Pac. Pr. & Lt. Co., Astoria, Ore.
Bailey, H. E., Fobes Supply Co., Seattle, Wash.
Bargion, Mr. and Mrs. H. L., Wash. Elec. Supply Co., Spokane, Wash.
Baughn, Eck. Yakima, Wash.
Beckman, G. R., Wash. Water Power Co., Moscow, Idaho
Bertrand, P. A., Grays Harbor Ry. & Lt. Co., Aberdeen, Wash.
Bennett, Lee, Mountain States Power Co., Sandpoint, Idaho
Birkett, M. W., Wash. Water Power Co., Spokane, Wash.
Bockmier, P. T., Wash. Water Power Co., Odessa, Wash.
Bogue, Grace H., Westinghouse Elec. Co., Seattle, Wash.
Booth, P. H., Edison Elec. Appliance Co., Ontario, Cal.
Boring, Geo. A., Pacific States Elec. Co., Portland, Ore.
Batwell, E. N., Puget Sound Power & Light Co., Seattle, Wash.
Boykin, A. M., North Coast Power Co., Portland,, Ore.
Brewer, C. M., Mountain States Pr. Co., Albany, Ore.
Brockett, Mr. & Mrs. Norwood S., Puget Sound Pr. & Lt. Co., Seattle, Wash.
Brownell, F. W., Puget Sound Power & Light Co., Seattle, Wash.
Campbell, Mr. & Mrs. C. B., Rainier Elec. Co., Seattle, Wash.
Canada, Chas. E., General Elec. Co., Portland, Ore.
Carpenter, H. V., State College, Pullman, Wash.
Carroll, R. S., Portland Ry. Lt. & Pr. Co., Portland, Ore.
Carty, H. H., Spokane Cent. Htg. Co., Seattle, Wash.
Chamberlain, R. G., Hurley Machine Co., Seattle, Wash.
Cheever, Markham, Utah Power & Light Co., Salt Lake City, Utah
Childe, R. B., Intermountain Power Co., Seattle, Wash.
Clark, R. W., Puget Sound Power & Light Co., Seattle,, Wash.
Clark, Walter C., Bunker Hill & Sullivan Mfg. Co., Kellogg, Idaho
Cobban, R. J., Westinghouse Elec. & Mfg. Co., Butte, Mont.
Coldwell, O. B., Portland Ry. Light & Pr. Co., Portland, Ore.
Colwell, J. I., Western Electric Co., Seattle, Wash.
Coman, W. E., Wash. Water Power Co., Spokane, Wash.
Cone, Donald I., Pac. Tel. & Tel. Co., San Francisco
Crawford, M. T., Puget Sound Pr. & Lt. Co., Seattle, Wash.
Crowell, B. J., Wash. Water Power Co., Davenport, Wash.
Cudworth, A. N., Northwestern Elec. Co., Portland, Ore.
Cull, C. P., Northwest Elec. & Water Works, Seattle, Wash.
Curran, S. R., Curran Sign Co., Spokane, Wash.
Currie, W. J., Wash. Water Power Co., Spokane, Wash.
Daniels, R. S., Wash. Water Power Co., Spokane, Wash.
Davidson, R. J., Pacific Pr. & Lt. Co., Portland, Ore.
Davis, R. E., Pacific Power & Light Co., Portland, Ore.
Doerr, A. B., G. H. Light Company, Aberdeen, Wash.
Donald, J. C., B. C. & Alta, Pr. Co. Ltd., Fernie, B. C.
Downing, R. A., Okanogan Valley Power Co., Brewster, Wash.
Drew, Hal. R., Duplex Lighting Works, Seattle, Wash.
Edwards, L. W., Coast Power Co., Tillamook, Ore.
Enloe, Mr. & Mrs. Raymond, Okanogan Valley Power Co., Okanogan, Wash.
Enlope, Mr. & Mrs. Eugene, Okanogan Valley Power Co., Spokane, Wash.
Faulkner, L. B., Olympia Light & Power Co., Olympia, Wash.
Farquhar, Mr. & Mrs. J. F., Wash. Water Power Co., Spokane, Wash.
Finley, J. G., Wash. Water Power Co., Spokane, Wash.
Fisken, Mr. & Mrs. John B., Wash. Water Pr. Co., Spokane, Wash.
Florine, F. N., Pacific Pr. & Lt. Co., Sunnyside, Wash.
Foster, Chas. S., Wash. Water Power Co., Spokane, Wash.
Fredricks, T. W., N. W. Elec. Equipment Co., St. Paul, Minn.
Gates, S. E., Gen. Elec. Co., Spokane, Wash.
Gille, H. J., Puget Sound Power & Lt. Co., Seattle, Wash.
Grant, L. R., Puget Sound Power & Light Co., Seattle, Wash.
Gray, Henry L., Consulting Engineer, Seattle, Wash.
Greisser, V. H., Wash. Water Power Co., Spokane, Wash.
Griffith, F. T., Portland Ry. Lt. & Pr. Co., Portland, Ore.
Groo, Jay S., Northwestern Elec. Co., Portland,, Ore.
Grunsky, Mrs. C. E., San Francisco.
Grunsky, Miss Clotilde, Journal of Electricty, San Francisco
Haggermiller, A. C., Wash. Water Power Co., Spokane, Wash.
Hamilton, W. M., Portland Ry., Lt. & Pr. Co., Salem, Ore.

H. R. WAKEMAN, Portland Railway Light & Power Company —

"The solution of the inductive interference problem, as that of merchandising, is cooperation."

—Northwest Electric Light and Power Association.

Harper, Mr. and Mrs. W., Chelan Elec. Co.,.....Chelan, Wash.
Harlan, R. G., Elec. Equipment Co.,.....Walla Walla, Wash.
Harris, Mr. & Mrs. D. E., Pacific States Elec. Co.,.....San Francisco
Henkle, J. C., Portland Ry., Lt. & Pr. Co.,.....Portland, Ore.
Hepler, S. G., Arrow Elec. Co.....Seattle, Wash.
Holsey, T. E., Wash. Water Power Co.,.....Spokane, Wash.
Hungate, J. W.,.....Spokane, Wash.
Hunt, Earl R., Wash. Water Power Co.....Spokane, Wash.
Husbands, Mr. & Mrs. Richard H., Pacific States Elec. Co., Seattle, Wash.
Hynes, W. F., General Elec. Co.,.....Portland, Ore.
Irwin, A. F., Wash. Water Power Co.,.....Moscow, Idaho
James, D. H.,.....Spokane, Wash.
Jennings, P. D., Puget Sound Power & Light Co.....Seattle, Wash.
Janssen, A. E., Idaho Power Co.,.....Boise, Idaho
Johnston, W. A.,.....Spokane, Wash.
Jones, W. E., Economy Fuse & Mfg. Co., ...Seattle, Wash.
Kennedy, Miss Don,.....Spokane, Wash.
Kerns, B. L., Westinghouse Elec. & Mfg. Co.,..... Seattle, Wash.
Kinder, J. F., The Universal Electric Co.,.....Ohio
Kinkaid, J. M., Northwestern Power & Mfg. Co.,.....Port Angeles, Wash.
Kirchhaine, Mr. & Mrs. F., Puget Sound Int. Ry. & Pr. Co., Everett, Wash.
Kirschberg, Hamilton Beach Mfg. Co.,.....Racine & New York City
Klehm, H. I., Wash. Water Power Co.,.....Tekoa, Wash.
Knowles, C. S., Pac. Pr. & Lt. Co.,.....Kennewick, Wash.
Leigh, H. R., Puget Sound Pr. & Lt. Co.....Seattle, Wash.
LeFever, Mr. and Mrs. O., Northwest Elec. Co.....Portland, Ore.
Lewis, J. D. .....Wilbur, Wash.
Lewis, Lewis A., Wash. Water Power Co.....Spokane, Wash
Lindsay, S. C., Puget Sound Pr. & Lt. Co.....Seattle, Wash.
Lindsley, E. A., The Lindsley Bros. Co.....Spokane, Wash.
Martin, A. A., Western Elec. Co.....Spokane, Wash.
McArthur, Lewis A., Pacific Pr. & Lt. Co.....Portland, Ore.
McCain, Mahlan, Flathead Valley Elec. Co.....Spokane, Wash.
McDonald, Alice G., Westinghouse Elec. & Mfg. Co.....Seattle, Wash.
McDonald, W. D., Westinghouse Elec. & Mfg. Co.....Seattle, Wash.
McDonald, D. T., Westinghouse Elec. & Mfg. Co.....Seattle, Wash.
McElroy, R. B., Wash. Water Power Co.....Spokane, Wash.
McGrath, W. H., Puget Sound Pr. & Lt. Co.....Seattle, Wash.
McHugh, W. E., Okanogan Valley Power Co.....Spokane, Wash.
McKissick, D. C., Northwestern Lt. & Pr. Co.....Wallace, Idaho
McMicken, A. C., Portland Ry., Lt. & Pr. Co.....Portland, Ore.
McNair, J. S.....Spokane, Wash.
McWilliams, J. A., Wash. Water Power Co.....Ritzville, Wash.
Meacham, W. M., Meacham & Babcock.....Seattle, Wash.
Melvin, H. L., Wash. Water Power Co.....Spokane, Wash.
Mendenhall, H. E., Little Spokane Pr. & Lt. Co.....Deer Park, Wash.
Mendenhall, Mark F., Little Spokane Lt. & Pr. Co.....Deer Park, Wash.
Miller, A. A., Westinghouse Elec. & Mfg. Co.....Seattle, Wash.
Miller, W. T., Wash. Water Power Co.....Spokane, Wash.
Monges, R. F., General Elec. Co.....Portland, Ore.
Morrill, R. H., Wash. Water Power Co.....Pullman, Wash.
Moon, V. H., Pac. Pr. & Lt. Co.....Pendleton, Ore.
Moore, R. J., Yamhill Elec. Co.....Newberg, Ore.
Morse, L. E., Wash. Water Power Co.....Spokane, Wash.
Moss, J. W., Wash. Water Power Co.....Spokane, Wash.
Myers, Geo. L., Pac. Pr. & Lt. Co.....Portland, Ore.
Neill, Thomas W., Kootenai Power Co.....Coeur d'Alene, Idaho
Nims, F. D., Wash. Coast Utilities.....Seattle, Wash.
O'Dea, M. L., Wash. Water Power Co.....Spokane, Wash.
Olsen, Bernhard, General Elec. Co.....Spokane, Wash.
Olson, Emil V., Wash. Water Power Co.....Spokane, Wash.
Onken, W. H., Jr., Electrical World.....New York, N. Y.
Orr, J. F., Idaho Power Co.....Payette, Idaho
Osborne, C. P., Portland Ry. Lt. & Pr. Co.....Portland, Ore.
Peters, W. E., Western Elec. Co.....Spokane, Wash.
Peterson, E. V., Westinghouse Elec. & Mfg. Co.....Seattle, Wash.
Phelps, Fred G., California-Oregon Pr. Co.....Medford, Ore.
Phillips, L. L., Pac. Tel. & Tel. Co.....Portland, Ore.
Putnam, W. R., Idaho Power Co.....Boise, Idaho
Putraw, P. A., Rainier Elec. Co.....Seattle, Wash.
Quinan, G. E., Puget Sound Pr. & Lt. Co.....Seattle, Wash.
Rogers, H. B., Pacific States Elec. Co.....Spokane, Wash.
Royer, J. E. E., Wash. Water Power Co.....Spokane, Wash.
Safford, L. W., Pac. Pr. & Lt. Co.....Kennewick, Wash.
Sansom, W. W., Portland Ry. Lt. & Pr. Co.....Portland, Ore.
Sawyer, Geo. C., Pac. Pr. & Lt. Co.....Yakima, Wash.
Schoolfield, H. H., Pac. Pr. & Lt. Co.....Portland, Ore.
Scott, W. A., Elec. Review.....Portland, Ore.
Scott, W. D., The Pac. Tel. & Tel. Co.....Seattle, Wash.
Scott, W. L., Wash. Water Power Co.....Spokane, Wash.
Sears, Geo. C., Puget Sound Pr. & Lt. Co.....Seattle, Wash.
Sebern, Millard, Wash. Elec. Supply Co.....Spokane, Wash.
Shields, F. M., Rathdrum Elec. Co.....Spokane, Wash.
Shortley, A. L., Inland Elec. Co.....Spokane, Wash.
Shreve, Lewis M., Wenatchee Valley Gas & Elec. Co.....Wenatchee, Wash.
Smallidge, F. E., Elec. Supply Co.....Wenatchee, Wash.
Sibley, Robert, McGraw-Hill Co.....San Francisco, Cal.
Siegfried, J. H., Pac. Pr. & Lt. Co.....Kennewick, Wash.
Simpson, J. S., Wash. Water Power Co.....Spokane, Wash.
Simpson, L. M., Deschutes Power Co.....Spokane, Wash.
Shivyer, W. C., Deschutes Power Co.....Spokane, Wash.
Slocom, J. B., Edison Lamp Works of G. E.....Spokane, Wash.
Stafford, Rex. T., Allis-Chalmers Mfg. Co.....Seattle, Wash.
Steel, Miles F., Benjamin Elec. Mfg. Co.....San Francisco
Steelquist, R. U., Mountain States Power Co.....Albany, Ore.
Strange, John V., Pac. Pr. & Lt. Co.....Portland, Ore.
Talbot, Guy W., Pacific Pr. & Lt. Co.....Portland, Ore.
Thatcher, R. E., Puget Sound Pr. & Lt. Co.....Seattle, Wash.
Tinkham, H. J., Pac. Tel. & Tel. Co.....Portland, Ore.
Tinling, Hugh L., Hutton-Tinling Elec. Co.....Spokane, Wash.
Tompkins, R. E., Wash. Water Power Co.....Colfax, Wash.
Turnbull, Ray W., Edison Elec. Appliance Co.....Portland, Ore.
Turner, H. W., Wash. Elec. Supply Co.....Spokane, Wash.
Van Riper, H. T., Edison Elec. Appliance Co.....Seattle, Wash.
Voellmeck, J. W., Kootenai Power Co.....Coeur d'Alene, Idaho
Wakeman, Mr. and Mrs. H. R., Portland Ry. Lt. & Pr. Co.....Portland, Ore.
Wallis, C. R., General Elec. Co.....Seattle, Wash.
Welch, J. G., Westinghouse Elec. & Mfg. Co.....Seattle, Wash.
Whitehouse, H. G., Wash. Elec. Supply Co.....Spokane, Wash.
Williams, H. R., Stevens County Pr. & Lt. Co.....Colville, Wash.
Wilson, G. L., Wash.-Idaho Water, Lt. & Pr. Co.....Lewiston, Idaho
Wollaber, Mr. and Mrs. A. B., So. Cal. Edison Co.....Pasadena, Cal.
Worth, Roy, Pacific States Elec. Co.....Seattle, Wash.

Lewis A. Lewis, commercial agent of the Washington Water Power Company, and secretary of the Northwest Electric Light and Power Association, is shown cooperating with Mrs. Lewis in looking as natural as possible. Mr. Lewis' specialty is cooperating, and to his active work, both in the convention and in the commercial field of his company, is due much of the success of merchandising in the Northwest. The gravity which H. H. Manny, Seattle representative of the Baker-Joslyn Company, is nobly trying to preserve, is made somewhat difficult by the irresistible joviality of H. W. Turner, Washington Electric Supply Company, Spokane.

ENGINEERS OF YESTERDAY

By A. L. Jordan

21. Prony.

What is the simplest appliance for measuring the horsepower of an engine?

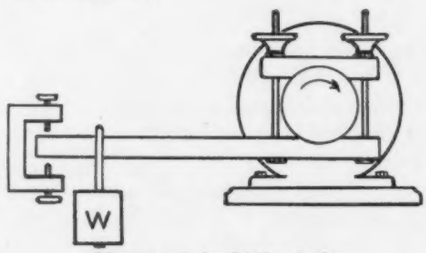


Diagram of the friction brake

Baron Gaspard Clair Francois Marie Riche de Prony (1755-1839) was a famous French engineer. He became Professor of Mathematics at one engineering school, and later the director of another, was engaged in important work such as the protection of certain districts from river flood-waters, became a Baron in 1828, a Peer in 1835 and yet we would never have heard of him but for his invention in 1800 of the useful friction brake.

This was originally two wooden beams clamped to the engine shaft, a known weight which could be moved along the arm of one beam, and some means of finding the revolutions per minute of the shaft. From these quantities the "brake horsepower" could be determined.

Many improvements (means of carrying away the heat produced, of preventing vibration, etc.) have been made, notably those by Poncelet, Lord Kelvin, James Thomson, Alden, and Ayrton & Perry; Froude and Reynolds have invented water brakes for large engines; but the most recent development is the use of the extremely convenient "magnetic friction" of the electric transmission dynamometer, the appliance now used by some of the leading automobile builders in their testing laboratories.

Pole Preservation

BY W. M. LEAVITT

(The durability of poles is a subject which directly affects the electrical industry, as well as being an important factor in timber conservation. The following paper on the subject was delivered by the secretary of the Western Cedar Pole Preservers' Association at the recent convention of the Northwest Electric Light and Power Association at Spokane.—The Editor.)

Timber is one of the country's most important natural resources, and its conservation is a vital economic question.

THE United States has reached a point in its development where an unnecessary waste of its natural resources is a matter of first importance to every good citizen. The science of treating wood to prevent deterioration has had a wonderful development in the last fifteen years, and is now recognized by all large users of forest products as an important factor in the conservation of our timber supply. The members of the Western Red Cedar Association have spent much time and money in personal investigation and experiments, and have cooperated at all times with the United States Forestry Service through its laboratory at Madison, Wisconsin, and with the National Electric Light Association.

The Forestry Department has conducted extensive experiments for the purpose of determining the increase that could be expected in the life of poles treated by different methods.

Technical Note No. 100, of the Forest Products Laboratory, Madison, Wisconsin, reads as follows:

"Light Creosote Oil properly injected into wood apparently will prevent decay until the wood wears out, or until it checks so badly that the untreated portions are exposed. That is the indication of service records collected by the Forest Products Laboratory on Railroad Ties and Telegraph Poles preserved with low boiling creosote."

The first treatment extensively used was the brush treatment which resulted in no penetration whatever.

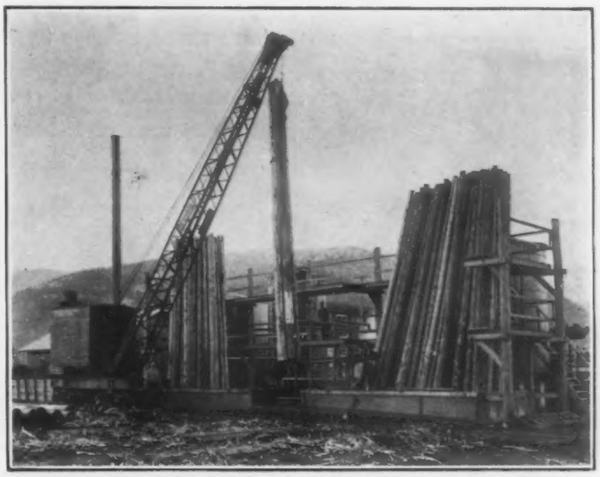
First Treating Plant Established

The first commercial plant established for treating poles was for the purpose of giving a dip treatment which consisted of a fifteen to thirty-minute immersion in a high boiling creosote oil heated to 112 to 140 degrees Fahrenheit. When poles were properly seasoned, this method resulted in a certain degree of satisfaction, but many of the poles treated by this method showed no penetration at all, and in no instance was the penetration sufficient to be any insurance against abrasion from handling or from checks occurring after treatment. This method is now known under Western Red Cedar Association Treating Specifications as treatment "A." The same process, using a lower boiling creosote oil is known as treatment "AA."

The open tank method which consisted of immersion in a comparatively low boiling creosote oil heated to 212 degrees to 240 degrees Fahrenheit for from four to twelve hours, followed by immersion in cold oil for from two to twelve hours, did not come into general use until about four years ago. This method is designated in Western Red Cedar Association Treating Specifications as treatment "B." Experience has shown that where poles have been seasoned for two years or more, a very satisfactory penetration can be obtained on a large percentage of the poles treated by the "B" method. It was found, however, that there was a certain percentage of poles, no matter how well they were seasoned, that the oil would not penetrate.

Development of Puncturing Method

One of our members conceived the idea of overcoming this difficulty by puncturing the sap wood of the poles with short steel points. He used a rubber belt eight inches wide and three feet long, and arranged the points so that a perfect penetration would be obtained if the oil traveled lengthwise of the poles two and one-half inches, and crosswise an eighth of an inch. This was a distinct improvement, and during the last two years a number of the treating plants have been puncturing all poles that they have treated by the "B" method. Difficulty was experienced, however, in getting a sufficiently deep puncture as the points had to be driven in with wooden hammers, and as this work was done by hand



A treating plant at Sandpoint, Idaho. The new "puncture treatment" ensures penetration of at least half an inch even in green wood, without affecting the strength of the pole.

A. C. McMICKEN, sales manager, Portland Railway Light & Power Company—

"The adoption of the report of the Advisory Committee on Cooperation is the most important step taken by the electrical industry of the Northwest in recent years."

—Northwest Electric Light and Power Association.

there was no assurance that the work was being properly performed.

About two years ago, we shipped into the Sandpoint Treating Plant for experimental purposes one carload of green poles, one carload of poles that had been seasoned twelve months, and one carload of poles that had been seasoned over two years. A number of the members of our Association who were interested in treating spent nearly a week at Sandpoint on these experiments.

The results of these experiments may be summarized as follows:

1. That, if the sap wood was properly punctured, a full sap penetration could be obtained in either a green or a seasoned pole.
2. That it was impossible by the use of steel points in a belt to puncture the sap wood of a pole in a proper and uniform manner.
3. That, where poles were not punctured there was no uniformity of results on either seasoned, partly seasoned or green poles. A considerable difference in the depth of penetration obtained, was often found on the same pole. Very few of the green poles or poles cut twelve months or less showed a penetration of over an eighth of an inch.

It was the unanimous opinion of those interested that in order to get a proper penetration a machine must be built that would properly puncture the sap wood. It took some time to conceive the plans for such a machine and have it built, and we did not get it running until about three months ago.

A Satisfactory Puncturing Machine

During the last three months all poles given the "B" treatment at the Sandpoint Plant have been punctured by the machine, and careful observation during that time would indicate that we are now in a position to guarantee that every pole will have a penetration of at least one-half inch.

A number of changes had to be made in this machine, and a new one incorporating these changes is being built at the present time, but the results obtained by using the first machine have demonstrated beyond a doubt that any penetration desired up to a full sap penetration can be obtained by using the proper size of puncture point.

We feel that this is an important achievement both for the cedar pole industry and for all users of cedar poles, as it is now a recognized fact that the depth of penetration has a direct influence upon the durability of the pole.

On the present basis of prices, the treating price of an 8-in. 40-ft. pole represents approximately 30% of the price of this pole delivered on a 30c. freight rate, 25% when delivered on a 50c. freight rate, and 20% when delivered on a 70c. freight rate. When you add to the original delivered price of your pole the cost of hauling and setting, the percentage of increase in the original cost on account of treating is really very small.

From the point of view of conserving our forest products the proper treatment of poles is a duty, and from an economic point of view measuring the value received for money expended, permanency of investments, and dividends, the proper treatment of poles is a necessity.

Reminiscences of Power Development on the San Joaquin

BY A. G. WISHON

(Running transmission lines into the wilderness, staking a fortune on its possibilities for development, venturing into the oil fields—these are but items in the early romantic history of the San Joaquin Light & Power Corporation, in its daring pioneer days. This is the second half of the story by its general manager.—The Editor.)

The load had already grown so that we had installed a 750-hp. Mackintosh and Seymour engine, which was the pride of Fresno, and that year we were forced to install a 350-hp. additional steam unit, to carry the load over the low season of water flow; but as it would be only a standby plant and presumably not needed except during low water flow, it was thought best to buy a second-hand engine that we found at the Union Iron Works, of a vertical, marine type. The load grew, however, to such an extent that notwithstanding the No. 3 Power Plant, that had 2500 kw. capacity, we were again obliged to bring this engine into action in 1907 during the low water season, when it blew the upper cylinder out through the roof of the power house without other accidents than coming down through the wire circuits that left the substation. These were easily repaired in the course of a day or two, but for a month or two we were very short of power.

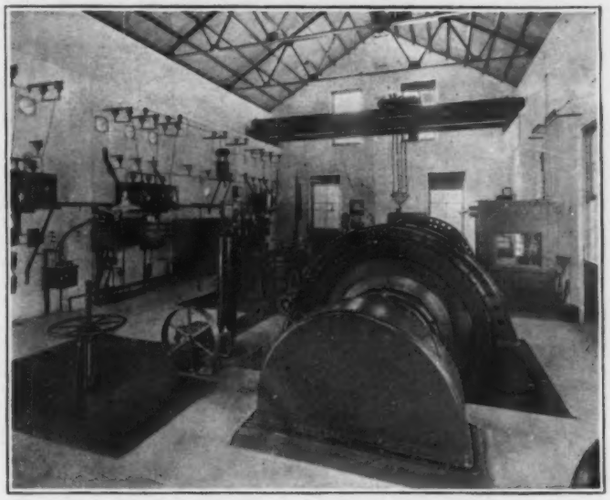
To get through the next year, we raised the bulkhead a little higher in the spillway of the reservoir and filled the reservoir four or five feet deeper—which caused the earthen dam to saturate and the management to lie awake nights, expecting the dam to go out every minute.

Growing Pains

After the panic of 1907 finances began to get better and the load heavier, and we then arranged

Power House No. 3 of the San Joaquin Light & Power Corporation was built in 1910 and was one of the first of five power houses now under the Crane Valley Reservoir.

for the building of the present Crane Valley reservoir. During the construction we enlarged the old No. 1 Power House from 1450 to 16,000 kw., but were again confronted with the serious problem of running the water in the old ditch while we made it



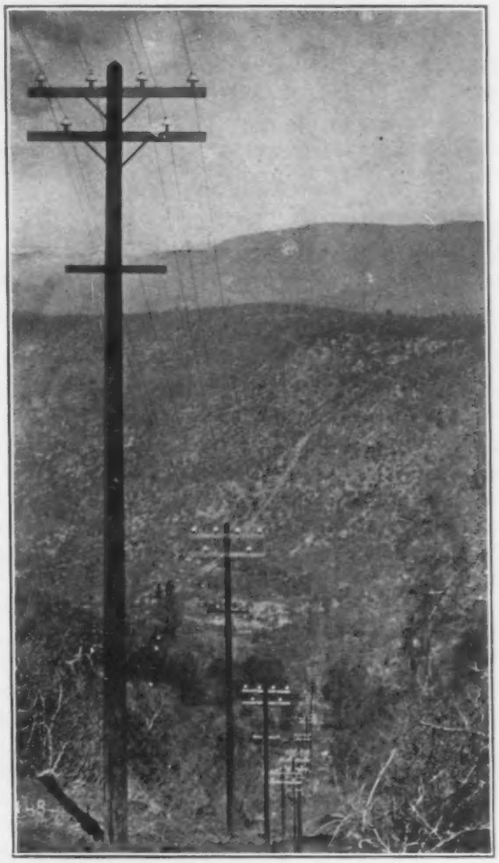
Power House No. 3 of the San Joaquin Light & Power Corporation equipped with Bullock 1000-kw., 3-phase, 550-volt generators. The armatures are Y connected with ground neutrals. The exciters are 6-pole, 125-volt d.c. generators mounted on the generator shaft between the generator and main bearings.

big enough to carry water for the new power house. The question as to how it would be accomplished was the subject for serious discussion of all the engineering talent that had been employed on the whole big job, but finally we agreed upon a plan and the desired results were accomplished.

About that time we took over the Power Transit and Light Company at Bakersfield, with its gas works, inadequate for the demands upon it; its railroad (single track and without ballast); its second-hand, antique type of cars, from San Francisco's earliest effort in that line; and with the power plant fifty per cent overloaded and no steam relay. Plans were formulated to build a 60,000-volt line down the west and east side of the valley, going via the "big west side" and the oil fields of McKittrick, Midway, and Maricopa, with the ultimate purpose of building another line down the east side of the valley, so as to utilize the capacity of the Tule River Plant as soon as it could be completed. The condition at Bakersfield was so desperate that we at once arranged with the General Electric Company to loan us a 750-kw. second-hand turbo-generator set, while we could take time to get through their shop the delivery of a new 2000-kw. set, the idea being to settle the steam plant troubles once and for good. But the first day we had charge of the Power Transit & Light plant one of the overloaded units in the Kern Canyon Power House burned out and deprived us of one-third of our capacity. Therefore, the town of Bakersfield went without street lights until we could get the borrowed steam unit installed, and finally, a week before the new plant was completed the borrowed plant burned to the ground.

We took over all of the employes that were then working for the plant, that we could possibly use. One of the employes, in a very important position, who seemed particularly capable and whom we planned to make a permanent part of our organization, in the course of a month tendered his resignation. By stealthy methods we learned that his reasons for leaving were based upon his theory that the Power Transit & Light Company were barely "getting by" with their old pay roll, and that we were all certain to "go to the wall" with the additions that we had made to it.

In the following two years we expended in Kern county more than two and a half million dollars, and were taking in from the oil fields and pump irrigation that the old company had never attempted to develop, more money than the total plant was earning when we bought it. A gas line was built some fifty miles to tap a natural supply from the Midway Oil Fields, and we spent as much more money in the extension of the gas works as the old company had invested in it, increased the number of consumers to twenty times what they were selling, notwithstanding that we reduced the price to one-third of what



Mountain pole line from old "San Joaquin" Plant No. 1 to Fresno, a distance of 35 miles. At the time it was built this was considered the longest high tension line in existence. It carried two 30,000-volt lines and a service telephone line.

H. J. GILLE, sales manager, Puget Sound Power & Light Company —

"Standardization is a good thing but it should not be permitted to impede progress nor unduly affect economy."

—Northwest Electric Light and Power Association.

they were getting. We also double-tracked and paved the street railway and provided it with modern cars, thereby increasing the service as well as the income.

Pioneering in the Agricultural Districts

Merced was equipped with a hydro plant at Merced Falls, with a capacity of 350 hp. when the river was up and 100 hp. when the river was low. It was backed by a 225-hp. steam generator, located in Merced, to help out in the low water season, but in a short time we extended our 33,000-volt line, which had already been built as far as the city of Madera, thirty-five miles farther to Merced, and started in on a development of the country business, which up to that time had not a single motor operating. Literally thousands of pumping plants are now operating in both Merced and Kern counties, far away from the town that formerly had the only available electricity.

A line was then extended from near Madera up through the big Miller & Lux ranch to Los Banos, but not until the management had gone over the country many, many times, and had given great consideration to the possibilities of development in a country covered by a big ditch system. I do not think we could have built then but for the public pressure that was brought to bear upon us. Our faith in the amount of heavy business that could be developed can be measured by the fact that we took the smallest wire that we have ever used on any extension to cover that district, believing that we were making a hazardous movement in covering that territory. Our estimates of income were exceeded one hundred per cent the first year and more than that for every subsequent year. Our entrance into the town and the turning on of the current was the signal for a public celebration and a big parade, in which the manager and his wife were invited to ride in the front automobile. A banquet and dance followed, with all the good things that go to show the appreciation of a really thoughtful and thankful people for a commodity so necessary to human existence. This line, of course, has long since had to be replaced by one of larger capacity and the voltage changed to 60,000. The possibilities up there, as elsewhere, have scarcely been scratched.

The little steam plants at Selma, Sanger, and Madera had already been junked and our system extended to cover those districts; and we now look back with amazement to the time when Dinuba, Reedley, Selma, Sanger, and Madera were carefully considered as worth $300 each per month income, and take satisfaction in comparing this with the many thousands that we are getting out of those districts today.

In the Oil Fields

The late John A. Bunting owned a steam-driven lighting plant in Coalinga; every joint of pipe was leaking steam and every generator was loose on its foundations and the old wooden buildings were nearly ready to fall down. It was more than forty miles straight across the plains from Lemoore, which seemed to offer about as much business as crossing a bridge. After much negotiation we secured control of this "bunch of junk," and by a separate company we took the chance of crossing those plains and that bridge to reach the town of Coalinga and the Coalinga Oil Fields, with the principal view of making an experiment in oil field operation. Pumping oil out of the ground in an oil field,.with no freight on the oil and considerable waste in natural gas in the field, probably did not look very conservative to a banker who was supposed to know all about financing utilities, but it was these oil fields that suggested the necessity of a variable speed, induction type motor, that was the means of bringing a new and great industry to electric operation. The results of the operation of that motor and of oil development by electric power is a matter with which all are more or less familiar, and the future possibilities when additional power is available in that line are almost beyond conception.

Past, Present and Future

The Tule River Plant was then completed, 11,000 kw. in steam was added to the Bakersfield Steam Plant, No. 2 Power House, Crane Valley and No. 1-A Power Plants completed, and a 12,500-kw. steam unit is now being added to the Bakersfield plant; the big Kerckhoff 30,000-kw. plant was completed in August; plans are out and part of the equipment ordered for the first unit of the Midway Steam Plant, that we expect will have at least 50,000 kw., while we are getting ready for the construction of 200,000 kw. on Kings River.

Many new and successful departures from standard construction have been inaugurated and operated by the San Joaquin, I believe, as pioneers; namely, outdoor type of substations, pole lines with 584-ft. spans, canyon lines of nearly 3000-ft. spans; split steel, angle type cross-arms; completely welded gas lines, that were installed in sections of 1500 ft. each, and many other changes from the ordinary practice of construction.

San Joaquin's income has grown from $10,000 a month at the beginning to more than $300,000 a month today. Their consumers have grown from 800 in 1903 to 46,000 in 1919; from two towns in 1903 to about one hundred and twenty-five towns in 1919; from the two counties to ten counties, covering a territory four-fifths as large as the state of New York; and a farming community comprising an irrigable area that will require irrigation by pumps for more than two million acres and including more than three-quarters of all the oil fields in California.

The management of the San Joaquin has often been charged by conservatives as visionary—but in looking back we are forced to the conclusion that we were dull not to have better understood the possibilities of development that have been unreeling during the last twenty odd years. We thought we had the vision, but now we see that the results are four to ten times above our fondest dream, and we believe now that it would be a daring dreamer who would predict in writing the situation as it will exist ten years hence.

Arch dam on Santa Inez River recently completed to provide additional water storage for Santa Barbara

The Construction of the Gibraltar Dam

BY N. A. BOWERS

(Every construction job entails enough "grief" such as delay in delivery of material, breakdown of equipment, bad weather, etc., without adding to these the necessity for bringing everything needed through a 4-mile hole not high enough to stand in and running knee deep in water. However, contractor Kraner overcame the many difficulties of such a problem and finished the Gibraltar dam on schedule. He is to be complimented and the city of Santa Barbara congratulated on the completion of a piece of work which is a credit to all concerned.—The Editor.)

On the Santa Ynez river about six miles east of the city of Santa Barbara that city has recently completed the construction of an arched masonry dam to provide additional storage for its water system. The site is on the far side of a high mountain range over which no roads have been built but which is pierced by a small tunnel 4 miles long through which the city receives its water supply.

The problem of building a dam which would provide the desired storage was chiefly a problem of getting equipment and materials to the dam site. The mountain range is very high and precipitous, and to go around by way of the mouth of the river would have meant many miles of road construction. In either of these routes the cost would have been prohibitive. The tunnel which was the only other alternative has a clearance of only 42 by 48 in. The city's water supply depends on maintaining a flow through this tunnel which at the time of lowest water is always 12 to 18 in. deep. Not to mention the continuous down pour from the roof in many places. Due to difficulties in driving the tunnel, its alignment is not good. However, these difficulties did not seem insurmountable to the contractors who signed a contract to carry out the work. The contract was made with Bent Brothers and W. A. Kraner, entire charge of the work being left in the hands of the latter.

Transportation through a Tunnel

How well the problem of transportation through the tunnels was worked out, is indicated by the fact that in the first three months of the construction period, 15,000 cu. yd. of concrete were poured in the dam with but little delay on account of tunnel difficulties. Of course rails were laid and a 220-volt trolley line was strung through the tunnel so trains could be operated electrically, but in order to secure the maximum clearance mentioned, large pieces such as motors, steam shovel boilers, and other equipment that could not be cut apart, had to be taken through on a special low car which was pushed by hand,—a trip requiring from 9 to 11 hours. The operation of the tunnel railway was under the direction of the city of Santa Barbara, the cost to the contractor being $2.00 per ton laid down beneath an aerial cableway near the dam, 2000 ft. upstream from the far portal.

Trains were operated through the tunnel for 16 hours out of each 24, there being two 8-hour shifts on each train crew. Four electric locomotives were used, of which one was considered a spare, so that three trains were expected to be in service continually. Of these one was ordinarily loading or unloading while the others were enroute. A siding was provided midway in the tunnel so that trains could pass at that point. The average time for a round trip was about an hour, so that with three trains, allowing time for loading and unloading, there would be a trainload delivery at destination every thirty minutes. Cement was taken through in 3-car trains, the

---

D. L. HUNTINGTON, president, Washington Water Power Company —

"The electrical industry has just passed through the hardest years of its existence but the future is beginning to look more rosy."

—Northwest Electric Light and Power Association.

load being 51 sacks per car. Each car was covered with heavy tarpaulin for protection from leakage from the roof and splashing from the car trucks. At the railway terminal the cars were not unloaded but were picked up bodily from the rails by the cableway carrier and hoisted across the gorge to the eminence at one end of the dam.

Equipment in Instalments

In a little over six weeks there came through the tunnel, piece by piece, two 1-cu. yd. mixers, six electric hoists, rock screens, skips, hoppers, and a steam shovel which the contractor had selected with an eye to the fact that the boiler would just meet the tunnel clearance requirements. Such equipment as concrete mixers were cut in pieces by an oxyacetylene torch for transportation through the tunnel and were welded together again on the far side. In between the shipments of all this equipment during this 6-weeks period there was also handled through the tunnel 40,000 sacks of cement and 275,000 ft. board measure of lumber. By reason of this expeditious delivery the contractor was able to pour 15,000 cu. yd. of concrete in the first three months, sometimes the quantity being as high as 420 cu. yd. in a single day's run.

The largest assembly job incident to getting the equipment through the tunnel was on the Thew steam shovel. When this shovel was delivered at the end of rail transportation, the miscellaneous collection of parts there assembled had all the general appearance of a wreck. The boiler of course had to go through intact, but practically all the other large parts were dismantled or cut to pieces. Platform and turntable were taken apart, and even the teeth were taken off the bucket. A total of approximately 1000 rivets were cut out in dismounting the shovel and later put back on arrivel at the dam.

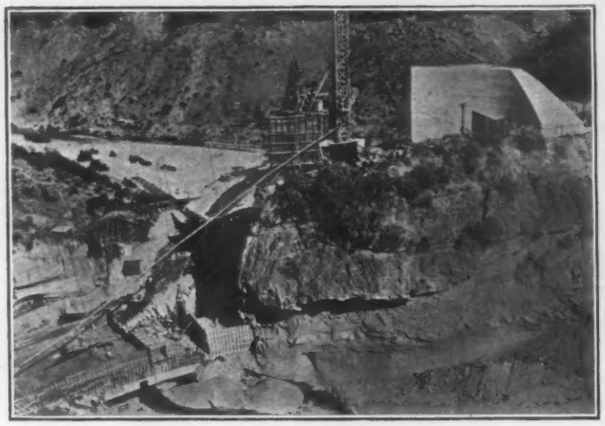
Of course all this had to be repeated when the equipment was shipped back to the "outside." It is notable that the two large concrete mixers, when finally returned to Santa Barbara, were still in first class serviceable condition after having been twice cut apart and welded together again.

Special tank cars were built for conveying fuel oil through the tunnel, as the city refused to run the risk of possible leakage into the water supply system from oil transported in barrels. Dynamite the city absolutely refused to permit in the tunnel at all so that this had to go by pack horse over a long, rough trail.

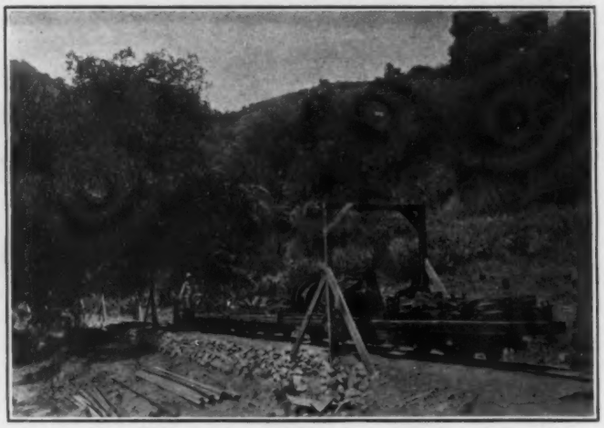
Structural Features

As to the dam itself, it has a total height of 185 ft. above bedrock. The radius on the center line is 238.5 ft., the width varies from 65 ft. at the bottom to 8 ft. at the top and the length measured along the curve is 1100 ft.

Because the south wall of the canyon was not high enough, a 3000-cu. yd. concrete block, triangular in plan, was poured to take the thrust of the arch in the upper part of the dam on that side. This was placed before the main body of the dam was begun so that it had about a year to set before being expected to carry thrust from the dam proper.



Construction view showing artificial abutment



Construction materials on electric train ready for the tunnel trip

On the side of the artificial abutment, away from the canyon, an extension of the dam structure in a straight line provides a spillway with its top 14 to 13 ft. below the parapet level, and about 300 ft. in length. The capacity of this spillway is about twice the maximum flood on record. Four concrete vanes, parallel with the direction of flow, and just below the rollway, were put in to prevent the current from cutting across toward the deeper portion of the canyon. The vanes have transverse holes at the bottoms so that the pools which serve as a water cushion drain out when overflow ceases.

When the water stands at spillway level, it will be 135 ft. deep behind the dam and will form a lake about 4½ miles long containing 16,000 acre-feet. The intake tower, which is built into the upstream face of the dam, has openings for admitting water at five levels, each opening being controlled by a 16-in. valve operated by a hand wheel from the parapet. Screens for these openings, placed on the outside, operate in grooves made in projecting ribs of concrete. From the intake tower in the dam, water will be conveyed through a 3½-ft. concrete conduit 200 ft. long to a 900-ft. tunnel. A measuring weir was put in at the lower end of this tunnel so that the quantity of flow could be conveniently gaged when desired. Below the weir 1600 feet of 3-ft. reinforced concrete pipe

connect the line with the north portal of the four-mile tunnel.

Rock and sand for the dam were obtained from deposits in the stream bed just above the site by a steam shovel, and were loaded in 6-cu. yd. cars which were hauled by a gasoline locomotive to the crushing and screening plant located in the river bottom 200 ft. upstream from the face of the dam. After crushing, screening and washing, the aggregate was transported by a 1½-cu. yd. automatic dumping bucket running on a 1½-in. cable to rock and sand bins on the hill above. The location of these bins and the mixing plant and tower with them was given considerable thought because of the necessity for reaching all parts of the curved structure conveniently from the one point of delivery. By building a 185-ft. tower on top of the south wall of the canyon it was possible to get ground anchorages for cables supporting chutes through which high gravity delivery was made to all parts of the work with only one change of the cable anchorage. The chutes were set on an angle of about 3 to 1, and delivery was made for a distance of 400 ft. each way from the tower.

Pouring the Concrete

Before concreting was started a reserve supply of 32,000 sacks of cement was brought through the tunnel and stored in a warehouse near the damsite. When concrete was under way the cars carrying 50 sacks each were picked up bodily as they arrived and transported across the canyon to the mixing plant by means of a cableway described on page 443 of the Engineering News-Record for February 27, 1919. The concrete was mixed and delivered to a 30-cu. ft. skip in capacity loads at the rate of one batch per minute, this rate being continued for long stretches at a time without interruption and without cutting the time of mixing below 30 seconds for each batch. Seven men were used in the mixing crews, assigned as follows: one man operating bin gates, one man dumping water, operating mixer and giving signals, two men unloading cement from cars, two men dumping cement from sacks into charging hopper, and one man bundling up and tying empty sacks.

A total of 54,000 cu. yd. was poured in spillway and dam (above streambed level). The work was completed and accepted in 18 months, although during 5 months of this time no work was carried on. The stoppage was deemed advisable because during the winter months the rock and sand deposits were ordinarily covered by high water. The contractor was particularly careful in securing alignment of the dam faces during construction, the result being that at no place on the dam is variation from true line greater than one inch. As a result of careful proportioning of the aggregates and handling of the concrete, the exterior surfaces are notably free from irregularities and voids.

When concreting was started a 4 x 6-ft. opening was left in the lowest portion of the dam. This was sufficient to pass the stream flow during construction. After the work was entirely completed and closure was desired a 4 x 5-ft. gate valve which the contractor happened to have on hand was fitted to a frame around the opening on the upstream face and arranged to be operated by a 3-in. pipe, 150 ft. long, running to a hand wheel on top of the dam. The pipe was held in place by wooden guides fixed to the face of the dam by expansion joints. After the gate was closed, the opening through the dam was concreted from the downstream end. No attempt was made to salvage the gate valve used to effect closure.

Progress of the Electrical Home Campaign

The above is a view of the dining room of the electrical home opened in Oakland last month. The use which can be made of the two-way socket was shown on the tea table at the rear, which is equipped with toaster and chafing dish.

In the bed room of the Oakland electrical home, the hair drier was placed, ready for operation on the dressing table. The warming pad was in evidence and the most convenient and pleasing bed room illumination was demonstrated.

Nearly thirty thousand people visited the Oakland electrical home during the eighteen days it was open for inspection (August 26th —September 12th), and the Walter H. Leimert Company, real estate firm for the home, reported $300,000 worth of property sold as a result of this publicity. The total attendance at all three of the electrical homes so far opened—San Francisco, Sacramento and Oakland—is between 56,000 and 60,000. Architects in these districts report their clients as constantly requesting more convenience outlets.

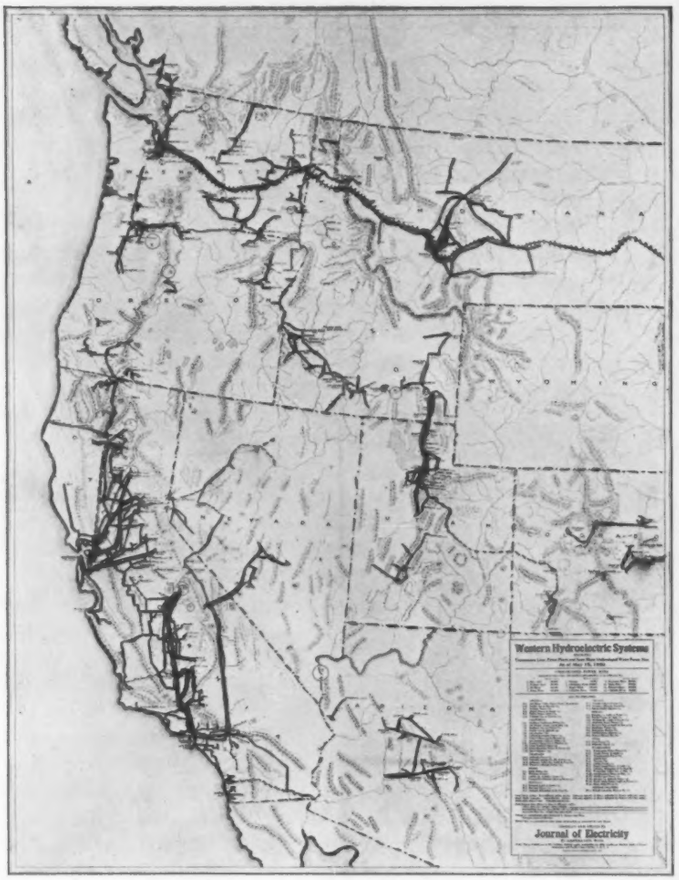


Fig. 1

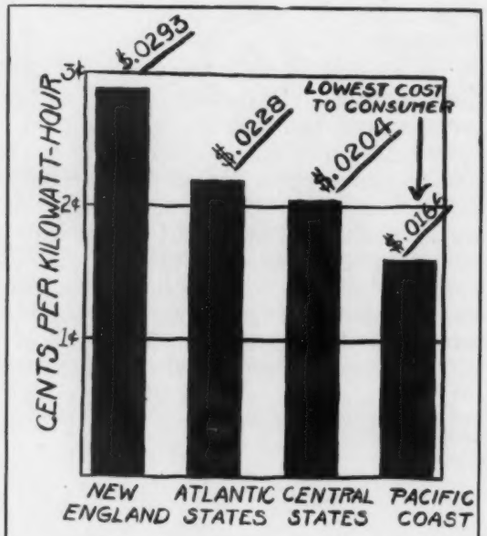


Fig. 2

More Power to the West

By ROBERT SIBLEY

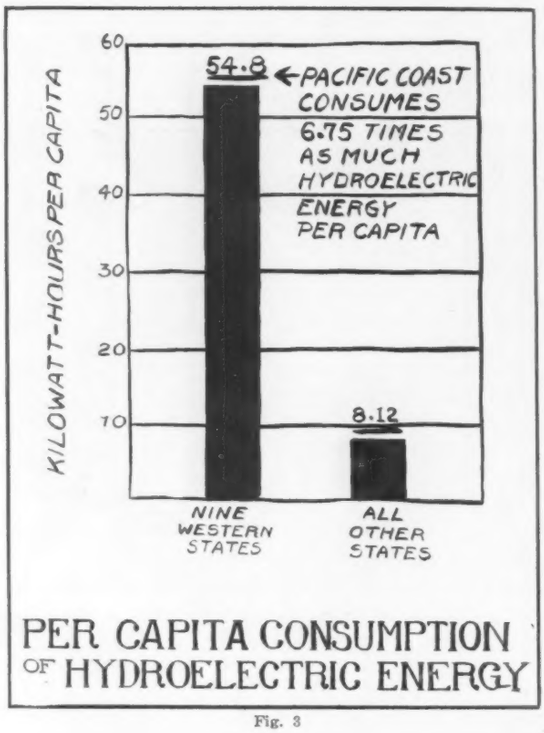


Fig. 3

HERE we see a graphic picture of an electrical empire that in vastness of vision, enterprise and daring, finds its equal nowhere else in the world. The heavy lines on figure No. 1 indicate the power lines which traverse the Western states — one interconnection from Medford, Ore., on the north down to the Mexican border on the south, thence up into Nevada—constituting a solid chain of copper wire 1400 miles in length from one end of transmission to the other and making possible the rapid interchange of blocks of power referred to on the editorial pages of this issue. In the height of dams that have been constructed, in the electrification of a transcontinental railroad, in the conservation of water, in the transmission of electrical energy at high voltage and over long distances, in the uses of electricity for pumping of water for irrigation and in developing the modern home electrical for the housewife, this section of our nation finds no equal elsewhere in engineering achievements. Such a development as this has brought about the economic situation shown in chart No. 2 where in comparison with the New England states, Atlantic states and Central states it is seen that the Pacific Coast states today sell electricity to the consumer at an average cost lower than that prevailing anywhere else in the nation. And yet, the big development has only started. Even though it does show in chart No. 3 that in hydroelectric generation and consumption the West today has a per capita use of elec-

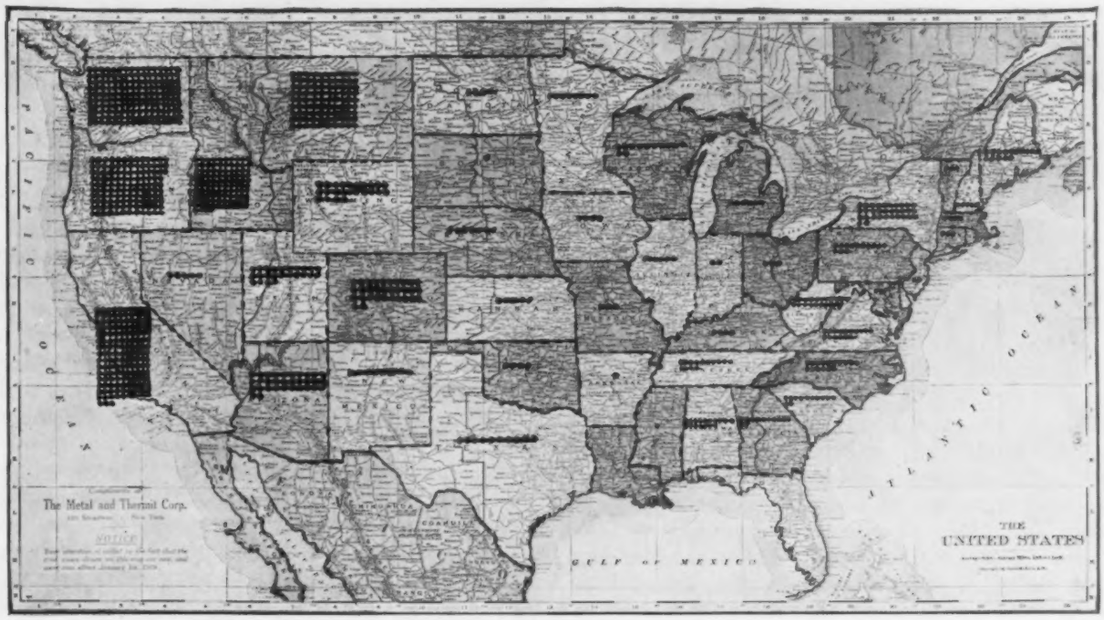


Fig. 4

tricity on the part of its citizens 6.75 times that prevailing elsewhere in the nation. For turning to chart No. 4 we see graphically represented the vast undeveloped water powers of the Nation in which it is seen that the eleven states from the Rocky Mountains to the Pacific Coast have within their boundaries some forty million horsepower, or seventy per cent of the vast undeveloped water powers of the nation, and yet to date the population in these states constitute but eight per cent of the national population. Recent accurate surveys of the power situation accomplished by the superimposing of power demand of all power companies west of the Rockies over the past ten-year period and projecting this demand into the future for nine years ahead indicates that with the present normal rate of growth of power development in the West, over seven hundred million dollars must be invested during the next nine years in order that the West may maintain its present wonderful strides in industrial and agricultural development.

In the vast financing of such sums of money, the self-interest appeal to the public is all-embracing and all-powerful. Chart No. 5 gives a graphic conception of this. The man within the industry, every citizen in the West, and indeed throughout the nation, is vitally interested, for these vast sums of money are to be directly distributed in channels in which he is interested. Take, for instance, the transformer man, who will receive seven and five-tenths per cent of the seven hundred million dollars; the man, also, who sells copper to the transformer man is interested; the man who sells fabric and the man who grows the material to go into the fabric is interested. Thus a delicate network of self-interest in this problem prevails throughout the nation. But to the man not directly interested in electrical matters a vital message of self-interest is also apparent, for it has been found in one instance, such as agricultural development, that for every farm that grows up in the country where electrical pumping is so necessary, two houses spring up in the city. Let us then look to chart No. 5 and see where these sums of money go. To the laborer, to the lumber man, to the real estate man, to the banker, to the carpenter; indeed to every branch of commercial, industrial and civic enterprise, the message is a forceful one and has a definite dollar-and-cent value. Hence the one toast we drink to the future of the Pacific and Mountain states is, "More Power to the West."

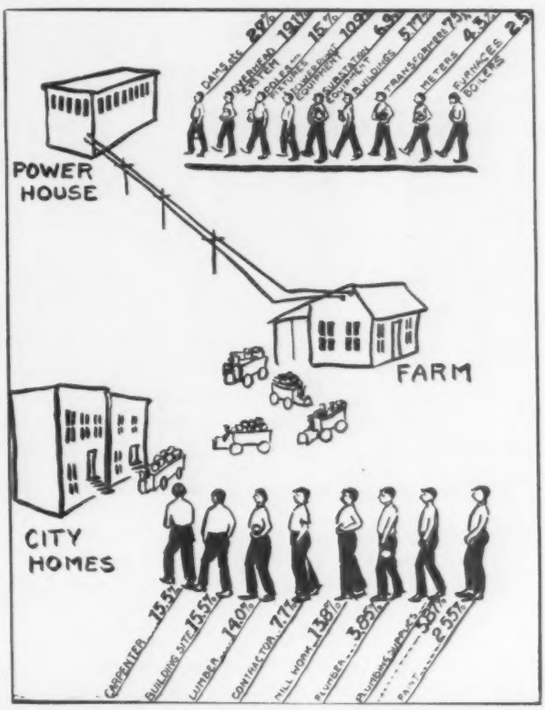


Fig. 5

Pamphlets and Clippings in a Business Library

BY VIRGINIA FAIRFAX

(The modern business house, whether it be office or industrial plant, accumulates great quantities of valuable material in the form of clippings, pamphlets and miscellaneous data. How to handle this type of material so that an item is instantly available when wanted is here taken up in the first of a series of articles by the librarian of the Carnation Milk Products Company, Chicago.—The Editor.)

THEIR VALUE WHEN ORGANIZED FOR READY REFERENCE

A New York bank, in one of its recent advertisements said: "Business judgment involving millions must be founded on facts. . . . Hasty judgment based on insufficient knowledge may cause widespread disaster."

The most successful business men of today are those who study the facts of their business, who study their trade papers and learn what other people are doing. It is the absence of accurate data, of complete knowledge, of planning supported by facts that causes disaster to enterprises that are launched without sufficient knowledge and not founded on facts. Any action is a gamble unless reinforced by exhaustive information and that information must consist, not only of precedent, but also of the experiences, experiments and discoveries of others in the specific field under consideration. A successful business man must gather these facts from original sources. The entire available field of information must be raked for facts applicable to the business needs of the individual business man or organization.

Where to Obtain Business Facts

How is the business man to obtain his facts? Where will he obtain the latest and most authentic information in order that he may have complete knowledge and avoid "hasty judgments"?

Years ago the business man depended on books for practically all of his facts. Scientific, industrial and financial problems were fewer than today. He had more time to read. He had more time to study and obtain the few facts that were needed for his business enterprises and these facts did not alter from hour to hour and become obsolete, as it were, over night.

However, in the present day of swift growth and rapid changes and when manufacturing and commercial organizations are conducting business in all parts of the world, the success of many enterprises hinges upon the character of the facts furnished for guidance and books alone, as sources of information, cannot be depended upon because many of them are out of date before they are printed. In fact, some of them are out of date before their authors have finished writing them. The value of books should not, however, be depreciated because undoubtedly many of them are most necessary in business, but the attention of the business man is emphatically directed to the value of a great Niagara of printed information that ought to be read because it contains the advance information from which books are made and in which will be found the accurate data and the last word on business facts.

If not through books, how is this flood of valuable information being spread? It comes in the form of pamphlets, brochures, reprints, reports, leaflets and letters. It is to be found in the scientific and technical journals, in the trade periodicals and in the newspapers. There are hundreds of technical associations, banks and commercial organizations, societies, clubs and private individuals printing and distributing information of great value on technical, economic, financial, industrial and sociological subjects that cannot be obtained elsewhere. Even in that class of printed matter which is designed primarily for advertising purposes, such as house organs and trade catalogs, will be found valuable experimental data, descriptions of tests and apparatus with diagrams and tables, that will not be found in books.

The many and varied departments of the Federal Government are printing and distributing valuable information. Also the departments of the various states and municipalities of our own and foreign countries are printing and distributing information on specific subjects, all of which may be had free of cost, or for a very nominal price. Most of this printed matter comes in pamphlet or mimeographed form. It records reliable facts and statistics, summarizes laws and furnishes up-to-date information that is needed day by day in business offices and for which the business man cannot wait until it gets into book form.

How to Make Pamphlet Material Valuable

Is this mass of printed material really of value? Most emphatically, yes, but not all of it to all business men. Bulletins, reprints, abstracts, periodicals and many newspapers specialize and that is what the busy man of today requires. It is not a very rare occurrence for a man to find in a single issue of a trade paper an idea that is worth many times all that he could pay for trade papers in a whole lifetime. By way of illustration: The librarian of an engineering firm noted in a trade paper an item of three or four lines that stated that the Geological Survey of a certain state had issued a pamphlet on the manufacture of water gas from bituminous coals. With the idea that it might possibly be helpful to one of the engineers who made a specialty of gas engineering problems, he wrote to the State Geological Survey asking for a copy of this pamphlet. When it arrived it was sent to the engineer's desk with a note calling his attention to it as something new that might contain some original ideas. After examining the pamphlet, he remarked that if certain ideas in it could be applied to a property on which he was working, and he saw no reason why they could not, it would mean a saving of many thousand dollars a year.

Every business man needs to have in his organization, as this business man had, a news gatherer who knows the interests and needs of that business organization, and who can classify the gathered news and make it available promptly, while it is news, or file the facts where they can be gotten quickly when needed.

The Value of Proper Filing

Government documents, miscellaneous pamphlets, clippings from newspapers, technical and trade periodicals, to be of use and of value must be properly classified and filed. It is a well known fact that many business men endeavor to keep miscellaneous pamphlets, reprints and clippings in their desk drawers, or stacked on book shelves, and when some special facts are needed, waste much valuable time hunting through this mass of dusty material for the information that they think they have stored away, or have a vague recollection that they saw somewhere, "not sure just where."

Business facts to be effective must be readily accessible and in such form as to be quickly comprehensible. This collection of informative data, these business facts, which so often clutter up a business man's desk, or through lack of appreciation of their value have been thrown away, could be effective and available on a moment's notice if correctly classified and properly filed.

The value of a file of reference material, or business facts, made from a careful selection of the pamphlets, reprints and leaflets that are sent to every business man, either unsolicited or by special request, and a judicious selection of clippings from newspapers and periodicals, cannot be over estimated. In private offices where such files have been established they have become one of the most essential and satisfactory tools of the business man. They give him the facts pertinent to his business interests in handy form, easy to consult, easy to carry about and study, in addition to the assurance that he has the last word on these subjects. The organization of files of this character requires careful planning, based on a knowledge of classification and indexing, a knowledge of sources for collecting facts pertaining to the task in hand and a wise discrimination in soliciting and discarding material. To be effective they cannot be managed in a haphazard way. Every one in the organization should cooperate. These files must be organized and maintained by some one who knows and who can give them the attention that is necessary to make them function properly.

What is the best method of filing this material, that is, what method is most economical of time and labor, making at the same time every little bit of information immediately available or useful, and also making possible the quick elimination of such material as may be supplanted by later knowledge or discovery?

Binding, boxes and scrapbooks have been used in past years with more or less success. Space does not permit of a discussion of the various advantages and disadvantages of these methods, especially since the vertical file is now generally recognized as the ideal way of handling pamphlets, clippings and office records in general.

What is a vertical file? A vertical file is made up of folders and guides standing upright in a drawer, or set of drawers, and arranged in some predetermined order. The folders are marked by number, subject or name to indicate their contents, and in them is dropped the printed material pertaining to that subject or name, according to the method of classification chosen. The advantages of the vertical file are that they keep the contents clean, free from dust, accommodate all sizes and shapes of pamphlets and manuscripts, are easy to consult, provide for speedy re-filing and "a place for everything," and from it out-of-date material is easily and quickly discarded. Such files of pamphlets and clippings are designated by various people as, "Information," "Reference," "Data" and "Subject Files."

The best method of classifying this material and the details of the equipment necessary will be discussed in subsequent articles.

AN ELECTRICAL STORM

Tonopah, Nevada, was recently the scene of a storm which resulted in a six-foot flow of water down the streets. The above picture, taken by J. Otts, was the only successful one out of 50 attempts.

J. V. STRANGE, assistant general manager, Pacific Power & Light Company —

"It is the idealism which is back of the cooperative movement which gives it its practical strength."

—Northwest Electric Light and Power Association.

Advertising

BY HOWARD ANGUS

(Making a salesman out of your window requires only taste and system, and is a form of advertising which will bring you a dollars-and-cents return as large as that from any other kind of publicity. The secretary of the California Electrical Cooperative Campaign here takes up the essentials of window display in the fifth of his series of articles on advertising.—The Editor.)

The show window has been called the silent salesman. If you doubt its pulling power, board up your store front and see what happens. Its value depends upon the location of the store, for in this as in all advertising, you want readers or lookers and their number depends upon how busy your street is.

The Value of the Show Window

The lowest value that any expert places upon the selling power of a window properly used is that

Motion in a window always attracts attention. On this mountain of foaming suds colored lights were played, while the machine was at work keeping the mass in constant motion.

it will increase your gross business 14% during the year, no matter where your store is located. Marshall Hale, of Hale Bros., in San Francisco, says that 14% is altogether too conservative. Most department stores charge their departments for one window display by the day or week. The value placed on these windows by the various department stores varies, but ranges generally from $25.00 to $100.00 a day for the department, depending on its location and size. A remarkable fact is that all departments of a department store not only are willing to pay the charge for the window, but are fighting for it. That emphasizes the important advertising value of a window. The four words—attention, interest, desire, action, are as important in a window's appeal to the buying motives as in other forms of advertising. The general weaknesses of contractor-dealers' windows are lack of unity, non-use of color, lack of display cards, and no seasonal tie-in.

Unity

Windows should tell one story at a time. If you attempt to display too many different kinds of appliances at one time, you confuse the looker, emphasize nothing in particular and are in great danger of having windows resembling a junk shop. Ninety-nine out of every hundred persons are one-idea people. Don't put your entire stock in the window; leave some appliances in the store for your salesman to sell. If you have a large window, you can divide it into sections, and allow each section to tell its own separate and distinct story. Kindred appliances can be displayed together. For instance, a laundry or kitchen can be set up. That gives one central idea. By frequently changing your window it is possible during the year to exhibit to the people in the street every article you have in the store. Frequent changes are absolutely essential. The longest time one display should remain in a window is a week. A change twice a week is still better, three times a week better still. People then begin to expect to see something in your window.

Color

Color is an important and integral part of the art of window decorating, and appeals especially to women, who are more artistic than men. Colors in

An electrical window can be as beautiful as the window of an art store if careful attention is given to color and lighting effects. Feature one thing in the display and never overcrowd the window. Note the use of display cards here.

your window must harmonize. Color-clashes jar the senses, even of those who do not pretend to any knowledge of color harmony. This is because color harmony is based upon certain laws of nature that are inescapable, and the eye feels discomfort when those laws are violated. Reduced to its simplest terms, one law of harmony is this:

Red, yellow and blue are called "primary" colors because each is elementary and cannot be produced by mixing. But they can be combined to produce other colors. Thus, red and yellow make orange; red and blue make violet; blue and yellow make green. These colors can, in turn, be combined to make still other colors, but the basis of all is red, yellow and blue. Harmony is achieved when, in any given color scheme, the three primaries are represented. For example, suppose we have a drape of rich blue velvet. What other color note is needed to give harmony? According to our law, it is a combination of the other primaries, red and yellow, or orange. Orange is the color needed, and might be supplied by a bowl of flowers, marigolds or California poppies, or a piece of silk. In a similar way, violet (red and blue) harmonizes with yellow; green (yellow and blue) harmonizes with red. Black, white and gray may be introduced without upsetting the harmony of the color scheme.

There is much more to color harmony than can be set down here, but what has been given will be sufficient to show that perfect harmony is seldom a matter of accident. Its attainment is based upon the application of exact knowledge gained through careful study and observation. For this reason it would be well to secure the advice of an experienced window dresser whose business it is to know the laws of harmony and how to apply them.

There are colors that give the impression of heat, or of cold; in fact, colors that typify and assist every idea you wish to express. For instance, red, yellow and orange are "warm" colors, and suggest heat, and, therefore, can be used very well with heaters but not with fans. Blue, green and violet are "cold" colors, and suggest coolness, and can be used very well with fans but not with heaters. Neutral colors such as gray can be used very well to set off your nickel-plated wear, as they make the article stand out clearly defined without any reflections. Red, however, makes the nickel-ware reflect a copperish tinge and is very detrimental. I had occasion the other day to spend some time in studying color in the windows of the San Francisco merchants. Every merchant in any way appealing to women had color in his window, and the dressing showed that they had given it considerable study. It will pay you as electrical merchants to study these windows and their colorings and assimilate the ideas that the merchants are using.

Window Cards

Also when looking over these windows, notice how many cards with something descriptive about the goods are in these windows. From personal observation I am safe in saying that practically every store in San Francisco selling to women has little cards in its windows either describing the goods or giving the price. You, appealing to women buyers as you are, also should have cards in your windows. These cards should describe the service of the article especially and should be brief, containing as a general rule one direct statement, because it is only by means of this that the service idea can be put over to the public. These cards should be made by a card designer. Unless they are artistic, they will give a cheap effect. Not to have a card in your window descriptive of the article or telling how economically it can be operated is like running in a newspaper an advertisement which consists of a picture and not a single word.

The display itself should also carry out the idea of the service of the article which can be best done by showing it in operation or in the place that it occupies in the home. An illustration of what I mean is a dining room table or a breakfast table entirely set with electric appliances in their proper place but conspicuously in the foreground.

Motion in the Window Display

A window with motion, of course, is better than a window without motion, because any moving object attracts attention and arouses interest, two of the fundamental principles of advertising and selling. But that motion must tie-in with the display and the story that the window is attempting to tell. An example would be a revolving table set for breakfast. This motion ties in very well because it brings the various appliances to the front of the window and shows them in order. A washing machine in operation is another good example. A fan blowing colored ribbons is another. Motion, however, that has nothing to do with the display does not help to tell the story and merely excites curiosity. It will attract people to your window but it will create no desire. An example of this would be jumping dolls or a monkey playing around in your window with your appliances set off to one side. Neither the dolls nor the monkey give any idea of the service rendered by electricity.

Seasonal Tie-In

Whatever appliances you are showing should tie-in with the season of the year. A close study of any other retail store of prominence will show you how careful its owners are in heeding the seasons. During the month of June, for instance, I passed many windows and read many advertisements in which the dealers were careful to mention or show the June bride. Did any of your windows tie-in with that idea during the month of June?

Illumination

Illumination is absolutely essential to a window. People at night are in a receptive mood. They are out to see, and are not worrying about business. Every night of the year hundreds of women go window shopping. They are merely strolling from store to store to see what they can see. Women walking to and from theaters and cafes always look at windows. Every window in the retail district should be lighted until 10 o'clock, or even later. For

---

R. M. BOYKIN, vice-president and general manager, North Coast Power Company —

"Every company is dependent to some extent on the experience of others and a policy of the fullest cooperation is the only basis upon which the work of any association can succeed."

—Northwest Electric Light and Power Association.

a merchant to neglect his appeal to the night crowd is unpardonable. During the day electric lights can be used to kill reflections. How many windows have you passed that were only a blur? Have they any value?

An electrical dealer's window should not only be illuminated but it should be the best illuminated window in the city. It should be an example that will give ideas to other merchants who are out looking over windows as well as to the general public. You are selling illumination. If you cannot light your own window properly, who wants your advice on lighting other windows?

Windows have a remarkable ability to sell small and moderately priced articles. The reason for this is that the average woman has the money necessary to pay for the article in her pocket. She will make the purchase on the impulse of the moment, the action immediately following the desire. Drug stores such as the Owl and Sun illustrate this fact. If you have two windows you should have small appliances in one of them, or in both if they can be made to tie-in in any way with the central idea. This does not mean that large appliances should be kept out of the windows, because they should be in the windows very often in order to impress the public to the point of buying. Attention has been called to the ability of the window to sell small articles for fear that you may overlook this very important detail, and leave them out of the window entirely.

Mechanical Analogs

BY G. R. SCHUCK

(The use of the mechanical analogy for the illustration of the electrical process involves principles which are capable of being very extensively applied in the analysis of electrical phenomena. Following is another of the series of analogs compiled by a member of the electrical engineering staff of the University of Washington.—The Editor.)

EFFECT OF RESISTANCE AND CAPACITY IN PARALLEL, AND RESISTANCE AND INDUCTANCE IN PARALLEL

In Fig. 3 open valves control circuits C and R. There will be a flow of fluid in C, represented by the curve I_C and a flow of fluid in R represented by the curve I_R (Fig. 6). The flow of fluid in the main pipes F at any instant must be the sum of the ordinates of curve I_C and I_R at any instant. And the complete curve of flow for one cycle may be obtained by adding all of the ordinates of I_C and I_R and plotting another curve. The shape of the resultant curve I_{CR} will be the same general shape as the two curves from which it was constructed. The time relation which the fluid pressure curve E bears to the resultant curve I_{CR} will be somewhere between the point of coincidence and a quarter period, I_{CR} leading.

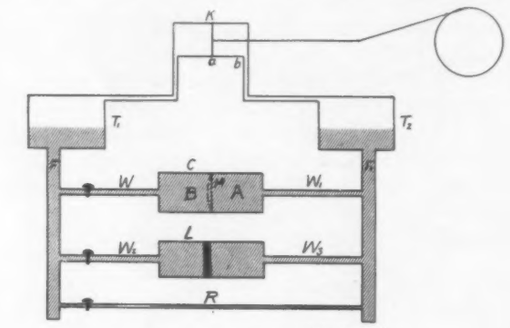


Fig. 3

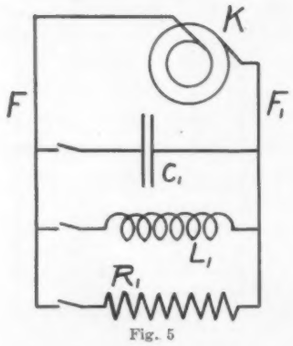


Fig. 5

Figure 3 above illustrates mechanically the principle of a cycle which is illustrated electrically in Figure 5 to the left. These figures are to be used in connection with the curves on the next page.

An exactly similar condition will be met when capacity and resistance are connected across the mains of an alternating current circuit. The current in the main conductors F and F_1 (Fig. 5) can be obtained by combining the current curves of C_1 and R_1 represented by I_C and I_R (Fig. 6), the resultant representing the main line current not only in amount, but in time relation or phase relation to the electromotive force curve. The angle of lead between the curve of fluid flow and fluid pressure will be somewhere between zero and ninety degrees, the exact angle depending upon the values of I_C and I_R.

A similar phenomenon will occur when the valves controlling R and L are opened and switches controlling R_1 and L_1 are closed, Figs. 3 and 5. The resultant flow L_{LR} is shown in Fig. 7 lagging behind the electromotive force at some angle less than ninety degrees and more than zero, depending upon the relative values of currents in R_1 and L_1.

Effect of Resistance Capacity and Inductance in Parallel

Open all of the valves in the circuit in Fig. 3, allowing the three currents of fluid to flow through the various circuits. To obtain the rate of flow in the feeder pipes F it will be necessary to combine all of the three curves as was done with the two curves, and obtain as before the total rate of flow, I_{CLR} (Fig. 8), not only in amount, but in time relation or phase relation to the electromotive force. It should be emphasized here that the current curves of L and C are exactly opposite to each other, the maximum value of each occurring at the same time. Therefore the elastic membrane of the circuit will be at its extreme position toward the right, while the disc D will be in its extreme position to the left, their motions at all times being opposite in direction. If the rated flow in D is the same as the rate of flow in L the summation or resultant of these two curves will

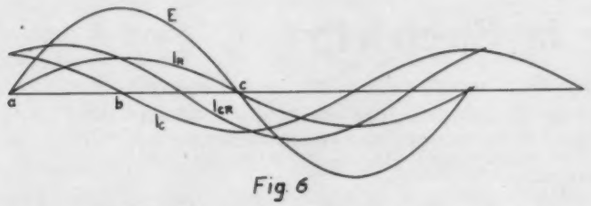


Fig. 6

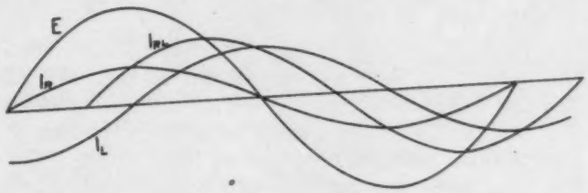


Fig. 7

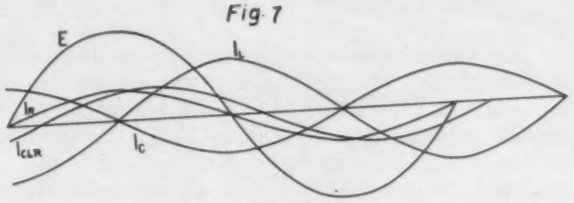


Fig. 8

Curves illustrating the relationships of resistance and capacity in mechanical and electrical circuits

be zero, and the only flow occurring in pipe F is that which supplies pipe R. **But where does the flow of fluid come from which supplies the circuit C and L?** An examination of the closed circuit C, L, and the connecting pipes will disclose the fact that the motion of the membrane M is timed exactly right with the disc D to cause a flow of fluid back and forth through this closed circuit, without being supplied by an actual flow from the main pipes F. In fact, if the valve in R were closed there would be no flow of current in the main F, the alternating pressure now doing nothing but regulating the frequency of oscillation in the closed circuit of L and C and possibly supplying a very small flow of fluid to account for frictional losses in pipes.

In Fig. 5, with all switches closed, exactly the same conditions will be met as in the analogous fluid system. If the proper amounts of capacity in C and inductance in L are used, the currents in each circuit will be equal and local oscillations of current will take place in L and C with no current being supplied from the mains, except that which supplies current to the resistance R and other ohmic resistances in the system; the electromotive force regulates the frequency of oscillation. This condition in electrical circuits is called "current resonance."

COMING CONVENTIONS

Illuminating Engineering Society—Fourteenth Annual Convention —	Cleveland, Ohio, Oct. 4-7
National Association of Electrical Contractors and Dealers—	New York City, Oct. 4-10
British Columbia Association of Electrical Contractors and Dealers —	Vancouver, B. C., Oct. 19
Electrical Supply Jobbers' Association of the Pacific Coast — Quarterly Meeting —	Del Monte, Cal., Oct. 21-24
American Mining Congress—Twenty-third Annual Convention —	Denver, Colo., November 15-20
American Society of Mechanical Engineers—1920 Annual Meeting —	New York City, December 7-11

Western Ideas

SPREADING INFORMATION is one of the principal functions of a business library, and one which is coming to be more and more appreciated. The library of the Southern California Edison Company uses, in the distribution of periodicals, the printed slip shown in the illustration. The magazine

FORM G.O-88 10 PADS 6 19

SOUTHERN CALIFORNIA EDISON COMPANY

DELIVER TO.....

SEE PAGE.....

DATE SENT .....

DATE DUE.....

UNBOUND MAGAZINES MAY BE KEPT ONE WEEK, UNLESS OTHERWISE INDICATED: BOUND MAGAZINES AND BOOKS TWO WEEKS. PLEASE DO NOT INTERLOAN WITHOUT NOTIFYING THE LIBRARIAN.

SEE REVERSE SIDE

This printed slip is used by the librarian of the Southern California Edison Company in distributing periodicals.

is sent around to the individuals in the organization to whom it is of special interest, accompanied in each case by a slip indicating the page number of the article to which attention is drawn, the date of sending and the date when due. On the reverse side of the slip is a space for the signature of each reader, and, opposite, for the name of someone to whom he thinks the number might be of value. In this way each department of the organization is kept in close touch with the current developments which especially concern it.

The terse, business-like manner in which library rules are presented on the front of the slip helps to keep these forgettable things before the borrower's mind.

LEWIS A. LEWIS, commercial agent, Washington Water Power Company —

"The best sign about the electric range business is that the companies which have most ranges on their lines are the ones best satisfied with them."

—Northwest Electric Light and Power Association.

Problem Course in Electricity

BY H. H. BLISS

(Do you know how to figure the power required for a mine hoist, the loss in a distribution line, the efficiency of a motor-driven pump? This article, the sixth of a series, carries on the discussion of power and efficiency started in the previous issue. The author is on the staff of the Riverside Junior College at Riverside, California.—The Editor.)

ENERGY LOSSES — MECHANICAL POWER

Lost Energy.—No mechanical machine operates without a loss of energy; the output is always less than the input by the amount of energy wasted in friction and turned into heat. Similarly every electrical device permits some of the energy to change into heat, and (unless heating is the object of the device) this constitutes an electrical loss.

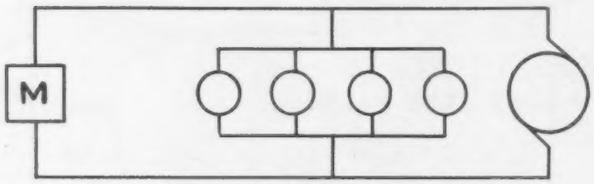


Fig. A.—Diagram of circuit containing generator lamps and motor, illustrating calculations in power and losses.

If it takes 3 volts to drive 12 amperes through a certain piece of wire, the power used = 3 × 12 = 36 watts. Evidently the 3 volts = the voltage drop in that piece of line, and hence we get the rule: **"Watt loss in any conductor at 100% power factor = amperes × volt drop in that conductor."** This leads to another rule: **"Watt loss in any conductor = amperes × amperes × ohms,"** since the volt drop = amperes × ohms. It is found that this last rule holds true for all cases of alternating currents as well as direct currents, though the proof is beyond the scope of this paper.

A circuit is shown in Fig. A, containing generator, lamps and motor, with which calculations in power and losses may be illustrated. Assume that the motor absorbs an input of 1.5 kw. while taking a current of 14 amperes; the lamps take 200 watts each; the resistance of the loop between lamps and motor is .3 ohm and the loss in the line between generator and lamps = 117 watts. We want to find the voltage at the lamps and at the generator, the resistance of the line, and the efficiency of the transmission system. To begin, the motor voltage = 1500/14 = 107. The drop between lamps and motor = 14 × .3 = 4.2 volts, so that the lamp voltage = **111.2.** The four lamps take 800/111.2 = 7.2 amperes, so that the current from the generator = 14 + 7.2 = 21.2 amperes. This number times itself (21.2 × 21.2 = 450) times the line resistance = 117 watts; hence resistance = 117/450 = .26 ohms for the loop or **.13 ohms per wire.** The drop in the loop = 21.2 × .26 = 5.5 volts. We might have got this from the loss and the current (117/21.2 = 5.5 volts) and then figured the line resistance. The generator voltage = 111.2 + 5.5 = **116.7.** The output of the generator = 116.7 × 21.2 = 2470 watts = input to the transmission system. The output = 1500 + 800 = 2300 watts. Efficiency = 2300/2470 = 93%.

It is interesting to inquire what the voltage at the lamps will be when the motor stops. We can add the lamp resistance to that of the line, and find the current from the generator voltage (which we may assume remains constant at 116.7 volts). Then the lamp resistance times the current gives the lamp voltage.

Mechanical Power.—One horsepower (hp.) may be defined mechanically as the power required to lift one pound at the rate of 550 ft. per second, or to lift 550 lbs. at one ft. per second. Hence the number of hp. required for any operation = pounds pull × feet per second ÷ 550. Then, if an automobile being driven at 42 ft. per second meets a total of 340 lbs. of road and air friction, etc., the engine must be delivering to the wheels a power of 340 × 42/550 = 26 hp. Some of the work done by the engine is always wasted in the transmission, differential, bearings, etc., so that the output of the engine may in this case be 30 hp. The efficiency of the apparatus between the engine and the tires may then be calculated as 26/30 = 87%.

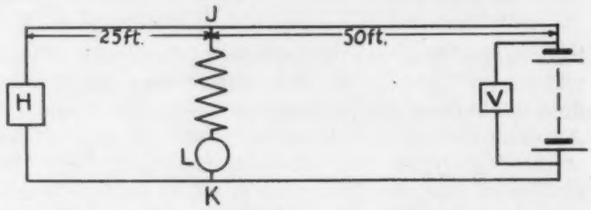


Fig. B.—Diagram of circuit containing battery and meter, as well as lamps, heater, and coil, illustrating calculation of resistances. See problem 69.

A pump of 60% efficiency is found to lift 640 lbs. of water per second to a height of 79 ft. What is the input? Output = 79 × 640/550 = 92 hp. Now, since efficiency = output ÷ input, input = output ÷ efficiency = 92 ÷ .60 = **153 hp.** If the pump is driven by a water wheel of 70% efficiency, the input to that = 153/.70 = 219 hp. The efficiency of the combination of machines = 92/219 = 42%. It is interesting to note that this equals the product of the separate efficiencies, .60 × .70.

Mechanical Kilowatts.—It is perfectly feasible to measure mechanical power in kilowatts, just as electrical power may be expressed in horsepower. Since one kilowatt is 4/3 of a hp., it requires the use of 4/3 of 550, or 737 in place of 550 in the formula. Then a machine which hoists 230 lbs. 80 ft./sec. has an output of 230 × 80/737 = 25 kw. What is its efficiency if the input = 40 hp.? Is it 25/40? No, for input and output must be in the **same units.** Changing the input to kw., we have ¾ of 40 = 30,

and efficiency = 25/30 = 83%. If we changed the output to kw., 4/3 of 25 = 33.3 and efficiency = 33.3/40 = 83%. This is a point to remember.

In conclusion, **No. of hp. = No. lbs. of force × No. ft. of distance ÷ (No. seconds × 550)**, where it must be clearly understood that the force and the distance are measured along the same line. For instance, in calculating the power required to pull a 20,000 lb. car up a hill 300 ft. long in 14 seconds, one must multiply the length of the hill **not** by the weight of the car but rather by the pull upon the drawbar—possibly 1000 lbs.—before dividing by 550 times the number of seconds. The same idea applies to lifting water; the total weight of the water is to be multiplied by the **vertical** distance of the lift, which may be far less than the actual length of the pipe which carries the water, since the weight overcome is a **vertical** force.

Answers to Power Problems

46. **.068; 2.27; 2 amperes.**

47. **4 amperes; 440 watts; .44 kw.;** 4/3 of .44 = **.59 hp.**

48. Volts × amperes × power factor = 11,000,000; hence current = 11,000,000 ÷ (100,000 × .80) = **137.5 amperes.**

49. 120/4 = **30 volts.**

50. Amperes = watts ÷ (volts × power factor) = 19000 ÷ (440 × .90) = **48 amperes.**

51.—Output = input × efficiency = 19 × .85 = **16.15 kw. = 21.5 hp.**

52. Output = 150 × 92.7 = 13,900 watts. Eff. of generator = 13.9/16.15 = 86%; eff. of M-G set = 13.9/19 = 73%.

53. Current = 110 ÷ (20 + 11 + .6) = 3.48; volts across heater = 69.6; power = 69.6 × 3.48 = **242 watts.**

54. 45,000 ÷ 2300 = **19.55 amperes.**

55. Input to set = 230 × 6 × .72 = 994 watts; output = 994 × .57 = 566 watts; current = 566/60 = **9.44 amperes.**

56. Output of generator = **8.8 kw.**; drop in line = 32 volts; input to motor = 40 × 188 = 7520 watts = **7.52 kw.** Eff. of line = 7.52/8.8 = **85.4%.**

57. Kva. = 12,000. Power factor = 9600/12000 = **80%.**

58. Current = 1800/224 = 8.04 amperes; resistance = 224/8.04 = **27.9 ohms.**

59. Combined resistance = 96.2 ohms. Circuit voltage = **110.6 volts.** Watts = **61.2, 51** and **15.1** respectively.

60. Answers: **1210 ohms; 484 ohms; 202 ohms; 121 ohms.**

New Problems

61. The voltage of a certain storage battery is 48; at its load the voltmeter reads 30. The resistance of the load is 15 ohms. Find the "loop resistance" and the ohms in each of the two wires of the loop. What is the watt loss in the line and what is the efficiency of transmission?

62. A 15-ampere arc lamp is fed through a rheostat of 2.6 ohms. Find voltage drop and watt loss in rheostat. Find power used in the arc itself, if the circuit voltage is 110.

63. The "equivalent resistance" of a 12-ohm heater in multiple with a certain coil measures 3 ohms. Find the ohms in the coil and the total power consumed by both devices on a 30-volt line.

64. Find the loss in the line in Fig. A when the motor is running and the lamps turned off, assuming that the motor draws 14 amperes.

65. The coils of wire known as the "armature winding" of a certain motor have a total resistance of .1 ohm. What is the watt loss in these coils when carrying 10 amperes? 20 amperes? 30 amperes? Another coil, known as the "field winding," has 16 ohms resistance. What is the loss here when 32 volts are applied?

66. If other losses in this motor (friction, hysteresis, etc.) total 150 watts, find input, output and efficiency when the field takes 2 amperes and the armature (in parallel with the field) takes 20 amperes at 32 volts.

67. In series with the 50-ohm transmitter of a telephone operator there is a 165-ohm "retardation coil" and two parallel "induction coil" windings of 18 ohms each. Find the current which flows through the transmitter from the 26-volt storage battery, and the power consumed in one of the induction coil windings.

68. What is the voltage at the lamps in Fig. A when the motor is taken off the line? What is then the line loss? (Take resistances and generator voltage as figured in the example.)

69. The meter in Fig. B has a reading of 30 volts; the lamp has 4 ohms and the coil in series with it has 2 ohms; the heater has 1.1 ohms; the wire has 2 ohms per thousand feet. Find resistance of the whole circuit outside the battery.

70. Find the current and line loss in each wire of Fig. B. What would a voltmeter read connected across J K? What if across the heater?

71. What horsepower is required to move the gravel up the "bucket ladder" of a gold dredge with a pull of 20,000 lbs. and a speed of 1.5 feet per second?

72. It takes a pull of 500 lbs. to tow a crippled automobile at 15 miles per hour. Express the power in hp., kw., and watts.

73. Find number of gallons of water lifted 110 ft. in 5 minutes by a pump of which the output = 26 hp. (A gallon of water weighs 8.3 lbs.)

74. This pump is 65% efficient and it is driven by a motor of 88% efficiency. Find the electrical input to the motor in hp. and kw.

75. A certain mine hoist is driven by an electric motor of 90% efficiency; there is a loss of 14% of the power in gearing, friction of sheaves, etc. When the input to the motor is 30 kw., what is the hp. applied to moving the cages?

76. In this mine, loaded and unloaded cages move in opposite directions, and are so connected to the hoist as to act as counterweights. Find the speed of the cages in Problem 75 if the loaded cage weighs 3300 lbs. and the unloaded one 1600 lbs.

77. A small electric locomotive exerts a drawbar pull of 1200 lbs. when moving a trainload of rock at 5 miles per hour. This over-all efficiency of the locomotive being 65%, what current does it draw from its 84-volt storage battery?

WIRED WIRELESS

Successful telephone communication has been held over live high tension lines by the American Gas & Electric Co., which has been convinced thereby that the method employed will solve one of its most important problems, namely, insuring a reliable and less expensive mode of communication between its load dispatchers and interconnected stations.

The test which proved the practicability of the method, was conducted during July between two of the company's stations, over a live 11,000-volt, 60-cycle transmission line, 12 miles long. Between the transmitting and receiving sets were the windings of the power transformers at both ends of the line and an underground cable, making the equivalent length of transmission about 21 miles.

The system employed works on the principle of the wired or directed wireless, and involves the use of apparatus to tune out the power-circuit frequency. The carrier current for the conversations had a frequency in excess of 5,000 cycles. The transmitting and receiving sets were connected with the 2,300-volt buses at each station, but they could have been attached to the 440-220-volt circuits with just as satisfactory results, according to engineers who have developed the system.

R. C. KENNEY, NePage McKenny, Portland —

"The success of the cooperative movement is dependent upon the concrete expression of it by every individual concerned."

—Northwest Electric Light and Power Association.

SPARKS—Current Facts, Figures and Fancy

(The largest pier in the world, the fastest American destroyer, the biggest bank clearings in the Northwest, the best paved city in the world—all these comfortable superlatives are introduced on this page, and anyone who is feeling downhearted is recommended to read them. Those who are not, can find out how to listen in on their neighbors' irrigation.—The Editor.)

Since the signing of the water-power bill in June applications have been pouring fast and furiously into headquarters at Washington. These now total applications for 500,000 hp.

* * *

Even if you can't talk to the motorman, it's nice to know his name. At least the city of Los Angeles thinks it worth while to equip its new one-man safety cars with a name-plate which introduces the operator to the riders.

* * *

One realizes that it is still a gloriously untamed America when statistics show that six-sevenths of our land is still uncultivated. It seems there is opportunity for all of the power we can develop, hydroelectric and otherwise.

* * *

A recent report shows San Francisco leading the world in street pavement work. She has 4,600,000 square yards of modern pavement and a public street paving program calling for an annual expenditure of $1,000,000. Of the paved area, 4,120,000 square yards are asphalt, 340,000 square yards stone blocks, and 125,000 square yards are brick.

* * *

A week's work for a family of four amounts to about eighty hours, or eleven hours a day, that is, when the house is not of the blessed 'home electrical' type. The same household, properly machined, requires only about sixty hours of work in a week, or a little over eight hours a day. Can the busy housewife make use of three hours daily leisure?

* * *

We might say that all that is gold does not glitter when considering a recent estimate that if the "hogged" fuel or saw mill refuse now being wasted in the Northwest part of the United States were put to use in the generation of electric power an addition of 3 billion kilowatt-hours would be made to our Western load. You never can tell where the riches lie.

* * *

The latest and speediest of our American destroyers, the "Satterlee," can make 38.257 knots because she is equipped with 14,000-hp. turbines which make possible the development of 31,223 horsepower. Each of these turbines drives a propeller through a floating frame gear that reduces the rated turbine speed of 3050 r.p.m. to 452 r.p.m. for the propeller.

* * *

Reports from France show that in truth, necessity is the mother of hydroelectric development. The scarcity of coal during the war has so hastened the development of this country's water power that it will be doubled in the six years, 1916-1921. Construction planned for 1920 and 1921 will bring the total development by the end of 1921 to 1,600,000 hp., or about 20% of the available power.

* * *

Those who like to see the figures down in black and white will be interested in the fact that Portland is rejoicing over an increase in bank clearings greater than she had expected even with the Shriner Convention as a booster. September statements up to the middle of the month put her ahead of all her progressive Northwest sisters, showing the clearings for those two weeks to be $99,249,536.

* * *

All parts of the old world are finding that the coal shortage is making the development of hydroelectric power a necessity. Two Italian companies, now capable of producing 20,000 hp. and 8,000 hp., find this output so inadequate that they intend to increase their plant to a capacity of approximately 280,000 hp. with a possible output of 700,000,000 kw-hr. a year. This would mean a saving of nearly 1,000,000 tons of coal.

* * *

Possibly the troubles of the irrigation district meter man are about at an end. Why? Because there has come a device which will allow him to do his work over the telephone. An electrical connection is made to what is known as the water watch or water meter so that a click is distinctly heard over a telephone. Thus by listening and counting the number of clicks to the minute it is easy to ascertain the rate of flow through the meter.

* * *

The electrical idea has been sold to the cooks of America. Seventy-five thousand electric ranges are in use at this time in the United States as against eight or ten thousand in 1915. And more than this, a certain manufacturer has made the statement that he is planning to turn out no less than sixty thousand ranges in the year 1921. Spokane comes forth to state that she can claim more of these electric ranges than any other city in the world.

* * *

Seattle announces that she is ready to take care of all her outlying districts can produce even through the most thorough application of electric power. Thirteen million cubic feet of warehouse space along the water front is generally considered ample housing provision for all producers that may choose their way through this port and then in case dock accommodations may not be what they should be, she has decided to build the largest pier in the world. It is to be 2,566 feet long and 360 feet wide and will be large enough to dock eleven ocean-going vessels at one time.

PERSONALS

Markham Cheever, general superintendent and chief engineer of the Utah Power & Light Company, Salt Lake City, Utah, has recently been appointed chairman of the Hydraulic Power Committee of the Technical Section of the N. E. L. A. This important appointment means much to the West. Mr. Cheever has been continuously connected with the construction and operation of hydroelectric properties for the past seventeen years at Niagara Falls and in Colorado, Idaho and Utah. The appointments on Mr. Cheever's committee from the various Western geographical divisions of the national association are as follows:

PACIFIC COAST DIVISION

H. A. Barre, executive engineer, Southern California Edison Co.
J. P. Jollyman, engineer electrical construction, Pacific Gas & Electric Co.
C. O. Poole, chief engineer, California-Nevada Power Co.

NORTHWEST DIVISION

John B. Fisken, consulting engineer, Washington Water Power Co.
B. M. Merrill, superintendent light and power, Washington Water Pwr. Co.
H. H. Schoolfield, chief engineer, Pacific Power & Light Co.
G. C. Sears, superintendent, Puget Sound Power & Light Co.
W. H. Trenner, chief engineer, Idaho Power Co.

ROCKY MOUNTAIN DIVISION

Norman Read, vice-president and general manager, Colorado Power Co.
J. A. Clay, general manager, Western Colorado Power Co.
J. F. Dostal, general manager, Colorado Springs Light, Heat & Power Co.

E. B. Skeels, formerly a civil engineer of Missoula, Montana, is now superintendent of the Bates and Rogers Construction Company with headquarters in San Francisco.

R. E. Fisher, commercial manager, Pacific Gas & Electric Company, has been appointed to represent the Pacific Coast Division of the N. E. L. A. on its Commercial Section.

George F. Wakeman, Pacific Coast representative of the Edison Storage Battery Company, with headquarters in San Francisco, has been called East to the parent company for consultation where he will remain for some weeks.

R. L. Emrick has been appointed superintendent of circulation, Pacific Coast Division, McGraw-Hill Company, Inc. Mr. Emrick succeeds Mr. A. T. Tregoning who has left the employ of this company to become circulation manager for the Coast Banker.

V. S. McKenney of the NePage-McKenny Company, Seattle, recently left that city for Kansas City, Mo., where he will supervise the installation of electric wiring, lighting, and so forth, in the new Pantages Theater under construction in that city. The NePage-McKenny Company was recently awarded the contract for this work.

A. E. Chandler, San Francisco attorney and engineer, has been spending the past two weeks as arbitrator for the Federal Court at Bishop, Inyo county, in a controversy between the Bishop Creek Water Users' Association and the Southern Sierras Power Company. Mr. Chandler is author of the well known book, "Western Water Law."

George Bush, formerly telephone specialist for the Western Electric Company in Seattle, recently resigned his position with that organization to accept a captaincy in the Signal Corps, U. S. Army. His place will be filled by John R. King, who formerly held an executive sales position with the Vulcan Iron Works of Seattle. Mr. King, some years ago, was affiliated with the Puget Sound Traction, Light & Power Company in the sales division.

Major U. S. Grant 3d, grandson of President U. S. Grant, and son of U. S. Grant, 2nd, is now head of District No. 2 in the War Department Service of Rivers and Harbors, his activities largely being those of upper San Francisco Bay, the Sacramento and San Joaquin rivers. Major Grant takes the place of Col. Kelly, who recently resigned to accept a position on the Water Power Development Board, brought into existence by the recent water power legislation.

H. A. Lemmon, formerly sales manager for the Truckee River General Electric Company of Reno, Nevada, is now head of the personnel department of Stone & Webster Company, with headquarters in Boston, Mass. Mr. Lemmon is doing splendid work in his new activities and it will be recalled that his knowledge of the subject of psychology and general personnel of salesmanship was of the highest order while engaged in activities on the Pacific Coast.

Barnet Lyon, member of the board of railway control of Holland and president of an investigating commission of electrical engineers, together with his associates, recently spent some time in Montana and Washington investigating the electrification of the Chicago, Milwaukee & St. Paul Railway. The others of the party were **V. L. Marinet,** chief of electrical traction, Netherlands, and secretary of the commission; **V. Vanlessen,** chief of electric service, Rotterdam and Schveninge Line; **H. Doyer,** consulting electrical engineer, and **M. Burgerdyke,** who is general manager of several interurban systems. These gentlemen spent some time over the Montana end of the system and more recently in Seattle, with a view to utilizing some of the principles in the electrification of state railways which is contemplated in the Netherlands. They left the West about the middle of September to return to Holland.

L. T. Merwin, who has recently been promoted from general superintendent to assistant general manager of the Northwestern Electric Company at Portland, Oregon, was graduated from the University of California in 1896. He began his electrical career with the San Joaquin Light & Power Corporation in 1901, as station operator, becoming chief operator at the Fresno plant and later assistant to the city superintendent. In 1906 he became superintendent of the Nevada-California Power Company, at Goldfield, Nevada, and in the following year electrical engineer for the Nevada Consolidated Mines Company. Early in 1912 he overhauled the electrical equipment in the Trinity Gold Mine in the northern part of California. In May Mr. Merwin came to Portland to assist in the design and later take charge of the construction of the Northwestern Electric Company's transmission line on the north side of the Columbia River Gorge. When the plants of the Northwestern Electric Company were completed he took charge of them as superintendent of operation. Since 1916 he has been general superintendent, in charge of all of the physical equipment of the company, which includes not merely a distribution system of light and power, but comprises an extensive steam heating system as well. It was in July of the present year that he became assistant general manager.

R. W. CLARK, Puget Sound Power & Light Company —

"Aside from the practical results of cooperation, the value of knowing each other and each other's problems is enough to make the cooperative league worth trying."

—Northwest Electric Light and Power Association.

Captain Howard M. Angus, secretary of the California Electrical Cooperative Campaign, has resigned his position to enter the United States Army as a Captain of Infantry. Captain Angus graduated from Occidental College with the class of 1913 with the degree of A.B. and from the University of Southern California in 1916 with a degree of J.D. After graduating from college he was employed as sporting editor of the Los Angeles Times and when the war broke out in 1917 attended the first Reserve Officers' Training Camp at the Presidio of California, graduating with the rank of Second Lieutenant. Captain Angus was assigned to the 362d Infantry and in the Meuse-Argonne offensive he was promoted to the grade of Captain for gallantry on the field of action. Upon his discharge from the army Captain Angus accepted the position of secretary of the California Electrical Cooperative Campaign on August 1, 1919, which position he relinquished on Sept. 28 to report to the Commanding Officer at the Presidio. A great part of the success of the Campaign is directly due to the untiring efforts and ingenuity of Captain Angus, who leaves the industry with the best wishes of all connected with it.

Alexander Wyllie, city electrical engineer of Auckland, New Zealand, is a recent San Francisco visitor.

Herbert C. Moss, of the Standard Electric Company, Seattle, recently enjoyed a short trip to Mt. Rainier.

J. B. Fullerton, district manager of the Apex Vacuum Cleaner Company, visited in San Francisco for several days this past week.

W. A. Rowald, superintendent of the Emeryville factory of the Western Electric Company, has left for a visit to the Hawthorne factory of this company.

A. B. West, vice-president of the Southern Sierras Power Company, Riverside, California, and **E. B. Criddle,** also with that company, are recent San Francisco visitors.

E. J. Wallis, Pacific Coast district manager of the Western Electric Company, has left for the East on an extended trip that will include the annual conference of company executives.

S. H. Taylor, president of the Electric Railway and Manufacturers' Supply Company, has left for a combined business and pleasure trip through the East. Mr. Taylor will be accompanied by his wife.

V. E. McCain, formerly engaged in sales work in the Tacoma offices of the Western Electric Company, has been transferred to the Seattle branch as house goods specialist. Mr. McCain made quite a reputation for himself in the Tacoma division and comes to the Seattle offices highly recommended.

W. L. Huber, consulting engineer with the Southern Sierras Power Company, and T. H. Means of Cope-Rand-Means Company, San Francisco, have been in Bishop representing the Southern Sierras Power Company in a controversy which is taking place there between that company and the Bishop Creek Water Users' Association.

C. E. Blee, assistant professor of civil engineering at Stanford University, has resigned his position on the staff of the University to return to the California-Oregon Power Company as assistant engineer to P. O. Crawford, who is chief engineer of the company.

L. J. Corbett, formerly professor of electrical engineering at the University of Idaho, who has during the past six months period been engaged as an associate professor of electrical engineering at the University of California, is now with the valuation department of the Pacific Gas & Electric Company, with headquarters in San Francisco.

A. H. Griswold, formerly plant engineer for the Pacific Telephone & Telegraph Company, with headquarters in San Francisco, and later Colonel of Engineers in charge of communication behind the trenches for the Allies on the battlefields of France, has now become assistant chief engineer of the International Western Electric Company with headquarters in New York City.

H. J. Gille, district sales manager, Puget Sound Power & Light Company, Seattle, **R. W. Lindley,** assistant sales manager, Bellingham division, and **L. R. Grant,** manager of the appliance department in the Seattle offices, will leave for Boston about Oct. 5, to attend a sales managers' conference to be held by the Stone & Webster interests in Boston. They expect to be away from the Puget Sound district about three weeks.

George J. Walton, formerly manager of Klamath Division of the California-Oregon Power Company, recently resigned to become cashier and a director of the First National Bank of Merrill, Klamath county, Oregon. **J. C. Thompson,** formerly secretary of the company, succeeded Mr. Walton in the company organization. His appointment became effective Aug. 1, and he is now "Division Manager Thompson," Klamath Division, with headquarters at Klamath Falls, Ore. **Byron H. Hurd,** formerly assistant secretary, is now secretary of the company.

W. W. Hanscom, consulting engineer, has recently been elected chairman of the San Francisco section of the American Society of Mechanical Engineers. Mr. Hanscom in 1886 went to work for the Union Iron Works, developing the electrical department of that company. He held the title of chief electrical engineer and in 1905 left the employ of the Iron Works to become manager of the Central Electric Construction Co. In 1908 he went into business for himself as a consulting electrical and mechanical engineer. The selection of Mr. Hanscom as chairman of the San Francisco section of the A. S. M. E. points toward an extremely prosperous season for that section with a broadening of its field of activity and usefulness.

Jay G. De Remer, consulting engineer, has been elected secretary of the San Francisco section of the A. S. M. E. for the next year. Mr. De Remer graduated from the University of California with the class of 1907 and for the next three years served with the Westinghouse Company as an electrical engineer. Mr. De Remer then served with the United Light and Power Company, San Francisco, and later went to New York. During the war he served as technical expert on anti-submarine devices for the navy and for the past year has devoted himself to consulting engineering. Many interesting trips are being planned for the section under the direction of Mr. De Remer which will augment the papers to be presented.

Meeting Notices for Electrical Men

(Information to the public concerning the activities and ideals of the power companies was the keynote of two important recent meetings — those of the Public Relations Committee, Pacific Coast Section, N. E. L. A., and the San Francisco Electrical Development League. Among other notable gatherings is the joint convention in Colorado where questions of vital interest to the industry were discussed.—The Editor.)

Public Relations Committee of Coast N. E. L. A. Discusses Work in Hand

When the Public Relations Committee of the Pacific Coast Section of the N. E. L. A. convened in San Francisco on the afternoon of Sept. 8, the meeting took the form of a general discussion as to how the committee could function to the best interests of the utilities. The proposed work for the Public Relations Committee of the N. E. L. A. was outlined by R. H. Ballard, chairman of the local Section, who suggested a division of the committee into three sub-committees as follows:

1. Committee on Public Information. The establishment of contact between the press, the public and the power companies. S. M. Kennedy was appointed chairman.

2. Company Relations with Employes. W. E. Creed was appointed chairman.

3. Relations of Regulatory Bodies vs. Public Utilities. This was discussed but the subject left open.

Results of public policy were shown through two editorials from newspapers of Los Angeles and Fresno, outlining the necessity of public utility development.

A general discussion as to newspaper contact brought out that paid advertising had its place and value and was necessary, but that news items relative to the development of the electrical industry and the necessity for that development as affecting the public should constantly be kept in the newspapers and before the public; that the best contact with the local paper was through the local district manager, who should be kept closely in touch with company news and who should be quoted in the items; that such news should be approved and edited and always kept strictly to facts.

Certain members took up the question of rebate on policy, and while it was generally agreed that fairness in satisfying the customer was paramount, some felt that such leeway in the settlement of accounts might be injurious. The financial statements being made by bond houses, where only part of the truth was told, were criticized as being unessential in the selling of securities.

On the question of company relations with employes, the consensus of opinion seemed to be that double checking by different department heads and probably by inspectors or personnel men could keep the managers in touch with the ideas of the employes so that the employes would be encouraged to enter more actively into all discussions. Power companies were asked to suggest anything along the line of rewards for efficiency in getting the best from an employe.

Contractors and Dealers to Meet in Baltimore

A score or more questions of vital importance to the electrical contractors and dealers of this country will be discussed at the twentieth Annual Meeting of the National Association of Electrical Contractors and Dealers to be held in Baltimore, Md., October 4th to 9th.

San Francisco Electrical Development League's Publicity Meeting

That the backing of all public-spirited citizens in the West is vitally necessary before the hydroelectric program now in view can render the requisite service to the industrial and agricultural development of that portion of the country was ably presented by Robert Sibley, editor of the Journal of Electricity, and Charles K. Field, editor of the Sunset Magazine, at the first fall meeting of the San Francisco Electrical Development League on Sept. 13.

It was journalists' day, and that profession was ably represented by the presidents or editors of eight daily publications of San Francisco and the Bay region. In addition all branches of the electrical industry were in good attendance, the total meeting numbering about 350.

With the use of charts, Mr. Sibley indicated that the Pacific Coast led all other sections of the United States in water-power resources, in lowest cost of energy to consumers, in highest per capita consumption and highest per capita revenue to the power companies, and brought home the need for continued cooperation in order to interest all parties in the region with this one big idea of development. From the projected expenditure of three-quarters of a billion of dollars in hydroelectric construction over the next nine years, he showed how all people in the areas affected would benefit by the development, and indicated the necessity of making the movement popular in order to attract the local finances.

Mr. Field showed a hopeful journalistic attitude toward cooperation, saying that

"as far as the industry is linked with the logical opportunity of the community and with its needs, immediate and potential, the press should keep pace with the industry. It would seem to our interests as journalists directly to do so, if we consider ourselves upbuilders of a community, rather than mere reflectors of its life or merely a part of its varied entertainment.

BUILDERS OF THE WEST — LXXXVI

D. L. HUNTINGTON

The sums of money required in coming months for the financing of hydroelectric enterprise are so vast that the greatest care must be taken in the visualization of the future and the maintenance of reserves in order that the utmost stability of these investments may be secured. To Daniel L. Huntington, president of the Washington Water Power Company, this issue of the Journal of Electricity is affectionately dedicated in appreciation of his contribution to the West in establishing for his utility organization, in the face of adverse industrial and economic situations prevailing in his territory for some years past, reserves that make for record attainment in Western endeavor of this kind.

F. D. NIMS, vice-president and chief engineer, Washington Coast Utilities —

"With 48 per cent of the developed hydroelectric energy in this region the West should feel the responsibility of leading in research along these lines."

—Northwest Electric Light and Power Association.

The mighty press demonstrated its desire to forward the electrical industry in the West at the Publicity Meeting of the San Francisco Electrical Development League, Sept. 13, 1920.

"If we grant that the development of a Western community is more or less proportional to and dependent upon its electrical development—and I think we may safely grant that—then it would seem that we have a distinct part to play and are not to leave it to the initiative and promotion of the industry concerned."

He brought out the vital fact of the never-ending cycle of reproduction in the water-power resources of the mountains as against the non-reproduction of the mineral resources used in power development.

Mr. Field struck one note of humorous interest when he asked "why there were a thousand and one different kinds of plugs for the thousand and one household appliances." But he partly answered it in suggesting that it provided the tired business man with a puzzle in finding a way to connect his percolator. He hoped for a standardization of attachment plugs.

Before the addresses a resolution was passed assuring David P. Barrows, president of the University of California, the closet cooperation of the League in securing from the state legislature such support and funds as may be necessary to bring the need for increased electrical engineering facilities into a concrete reality.

Previous to this, clear reports were presented by the Statistical Committee, showing statistics of the electrical industry in the city and county of San Francisco, and by the Public Policy Committee as to its recommendations.

San Francisco Downtown Association Hears Hydroelectric Talk

Bringing home to the business man the service of the central station, John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, spoke before the Downtown Association of San Francisco on Sept. 15. He briefly traced back to its inception the use of electricity for lighting, and touching on its development and that of the central stations in the West, brought the idea right on down to the present day, with references to the records in construction which have been established in the Western states.

While he stated that in the past capital couldn't be enticed into the several districts to develop the huge water-power resources of the West because of the short-sighted policy of the government in not releasing water powers, he believed these resources had been unlocked through the passage of the water power bill and that the necessary finances would be forthcoming. In this respect, he gave fifty millions of dollars as the amount of new capital needed each year to carry on the electrical development of the West.

San Francisco Electrical Retailers Elect Officers

The Electrical Retail Dealers' Association of San Francisco met on Sept. 29 to hear Harry Saxe, vice-president of Bunster-Saxe Company, on the Installment Plan Systems, covering methods of determining credits, handling accounts, and the effect of the installment plan on profits.

Officers of the organization as elected at the last meeting are M. L. Scobey, president; Percy Schwartz, vice-president; M. P. Meyer, Louis Levy and W. S. Hanbridge, executive committee. J. L. Richards is chairman of the membership committee and W. D. Kohlwey, chairman of the public policy committee.

Colorado Convention Features Utility Finance and Regulation

The seventeenth annual convention of the Colorado Electric Light, Power and Railway Association and the first convention of the Rocky Mountain Division, N. E. L. A., were held jointly at Glenwood Springs, Colo., on Sept. 13, 14 and 15.

Utility securities were discussed by A. C. Foster, president of the Bankers' Trust Company, Denver, who spoke in an optimistic tone on their future. Norman Read, Colorado Power Company, and president of the Association, took up the lack of understanding of the problems of the utilities by the public. He said that marketing of these securities would be easier and the public would be led to a better appreciation of the service by an educational campaign to foster a spirit of respect for the utilities and commissions. Mr. Dwight, engineer of the Public Utilities Commission of Colorado, spoke strongly for a better understanding between the utilities and the commissions, and brought out that although the commissions now have a better knowledge of the public utilities, cooperation is needed to combat for the common good the forces which are working to bring regulation to naught.

The necessity of uniformity in power contracts throughout the state was emphasized by T. O. Kennedy, Denver Gas & Electric Light Company, who indicated the wide divergence of practice in charging for extensions and in apportioning the costs among the various users of the line.

The newer and broader activities at the headquarters of the Association were clearly defined by Martin Insull, president of the N. E. L. A.

Regulation from a public policy viewpoint and the obligations under which the utilities labor were discussed by W. H. Onken, Jr., editor of Electrical World. He touched particularly on a higher phase of municipal ownership

through customer ownership of securities and told why preferred stocks and bonds were being taken rather than common stock.

C. A. Semrad, Boulder, general manager of the Western Light & Power Company, was elected president; T. O. Kennedy, Denver, general superintendent Denver Gas & Electric Light Company, was elected first vice-president, and F. Norcross, Greeley, was elected second vice-president.

Convention of Illumination Engineers

The question of electric lighting in all its phases will be discussed at the fourteenth Annual Convention of the Illuminating Engineering Society which will be held in Cleveland, Ohio, October 4th to 7th. J. E. North, of the Cleveland Electric Illuminating Company, is chairman of the general convention committee.

Monograph on Illumination Before San Francisco Bay Cities Chapter I. E. S.

A first presentation of Dr. George A. Hoadley's paper "Monograph on Illumination" was given before the San Francisco Bay Cities Chapter of the Illuminating Engineering Society on Sept. 24 by Russell Hoadley. The paper is an interesting and authoritative history of lighting from the earliest period to the present day, and was illustrated by slides.

Mr. Hoadley traced the development from the time when the open fire was the only means of illumination through the use of the pine torch, fat lamp, the candle, whale oil, found late in the seventeenth century, down to mineral oil which is still widely used. With the use of gas and electricity came the necessity for some form of central station and distributing system.

The greater the application of illumination the more necessary it is to study such phases as measurement, distribution, glare, effects upon color of objects, design of fixtures and so forth, each of which was covered in the monograph. Although illumination is one of the youngest of the sciences, it was brought out, great results have already been accomplished, but there is still much to be done to perfect a system which it can be produced cheaply, easily and of such a quality that it will be restful and not harmful to the eye.

McGRAW-HILL SERVICE AND FEDERATED AMERICAN ENGINEERING SOCIETIES

James H. McGraw, president of the McGraw-Hill Company, Inc., has expressed himself in favor of the Federated American Engineering Societies in the following letter which was sent to each of his editors. It shows such a wholesome endorsement of the principles governing the new federation that it is presented here that all engineers may benefit by his opinion. The Journal of Electricity is heart and soul for the accomplishment of this new ideal, for the Journal of Electricity sees in this movement the salvation of the engineer, comment upon which may be found on the editorial pages of this issue:

"I think we should organize the editors for definite action. The editors must work this out themselves, each for his own paper, to be sure, in his own language, but the McGraw-Hill editorial policy is to put it over—to get it done—to line up the engineers of the country or to rally them to the big idea. If it flounders for lack of definite leadership very long, it will all go in the discard, as it should. We must not let our publications flounder or fall down in this matter for lack of coordination. In other words, we should organize and develop a definite program of action, and be all ready for this next official meeting. The engineer has a much bigger place in the world's affairs than he, himself, realizes, bigger than the public realizes. Engineers as a class have never acted together, hence have never reaped the harvest of team work. If the McGraw-Hill engineering papers can compel attention to the NEED and PICTURE the results in the way of accomplishment for the engineer and the public, we will be rendering a great public service. We are given a great opportunity to serve,—to serve the engineer and the public, and at the same time our own interests. If the Federated Societies eventually fails, if we do our work right, we have made a bigger place for the engineer, and we have earned his everlasting gratitude. Here is the kind of an opportunity for which we have been looking."

NEW OFFICERS

Northwest Electric Light and Power Association

The following elections and appointments were made at the recent Spokane convention of the Northwest Electric Light and Power Association:

EXECUTIVE COMMITTEE

P. A. Bertrand, general manager, Grays Harbor Railway & Light Co.
R. M. Boykin, vice-president, North Coast Power Co., Portland, Ore.
John B. Fisken, consulting engineer, Wash. Water Pr. Co., Spokane, Wash.
S. R. Inch, vice-president and general manager Utah Power & Light Co., Salt Lake City, Utah.
O'dell McConnell, vice-president Helena Lt. & Ry. Co., Helena, Mont.
Geo. L. Myers, assistant to president, Pacific Pwr. & Lt. Co., Portland, Ore.
W. R. Putnam, vice-president and general manager, Idaho Power Co., Boise, Ida.
H. L. Walther, division superintendent, California-Oregon Power Co., Medford, Oregon.

The vice-presidents for the various states were elected as follows:

Norwood W. Brockett, attorney, Puget Sound Traction Light & Power Co., Seattle, Wash., vice-president for Washington.
Geo. L. Myers, assistant to president, Pacific Power & Light Co., Portland, Ore., vice-president for Oregon.
S. R. Inch, vice-president and general manager, Utah Power & Light Co., Salt Lake City, vice-president for Utah.
O'dell McConnell, vice-president Helena Light & Railway Co., Helena, Mont., vice-president for Montana.
W. R. Putnam, vice-president and general manager, Idaho Power Co., Boise, Idaho, vice-president for Idaho.

The election of Franklin T. Griffith as president of the Association was announced in an earlier issue.

Synchronous Club Opens Season

The first meeting of the Synchronous Club of Los Angeles for the new term was held in the auditorium of the Edison Building on Sept. 14. The subject for the evening's discussion was single phase motors, the principal speaker being H. D. Easterbrook of the Westinghouse Electric & Manufacturing Company, who spoke on "Development and Peculiarities of Fractional Horsepower Motors." He commented on the insistent demand for motors of this type and stated that there was plenty of room for some Western manufacturer to engage in this business. Quite recently a Los Angeles concern producing a small device asked for prices on 25,000 small motors, an order which could be handled to advantage by a local dealer. Many improvements in motor design were noted and discussed.

Tour of Industrial Plants in Bay Region Planned

A series of visits to the largest industrial establishments in the San Francisco Bay region is a part of the interesting and comprehensive program which is being planned by the executive committee of the San Francisco Chapter of the American Society of Mechanical Engineers. On October 7 the Union Iron Works of San Francisco will be visited, and a trip to the Mare Island Navy Yard for the purpose of visiting the super-dreadnaught "California" is scheduled for the early part of November.

This trip will probably form part of the grand celebration to be held on the fourth and fifth of November commemorating the fortieth anniversary of the national American Society of Mechanical Engineers. Plans are being made to connect local chapters by transcontinental telephone at this time, so that the speeches made at A. S. M. E. headquarters in New York will be heard by members of the society in all parts of the nation.

The officers of the San Francisco Chapter for the coming year have been elected as follows:

W. W. Hanscom, electrical and mechanical engineer, chairman; J. A. Kinkead, vice-chairman; J. G. DeRemer, consulting engineer, secretary; C. M. Gunn, president, Gunn, Carle & Company, San Francisco, committee member; R. A. Hudson, Hunter & Hudson, San Francisco, committee member.

WM. M. HAMILTON, Portland Railway Light & Power Company —

"The important word in the industry today is 'action'—if we went home and put into effect one-fourth of what we preach, our difficulties would in large measure be solved."

—Northwest Electric Light and Power Association.

HAPPENINGS IN THE INDUSTRY

RECORD SIZE WATER WHEELS ORDERED FOR P. G. & E.'S PIT RIVER STATION

Two 40,000-hp. single runner, vertical shaft, hydraulic turbines and all generating equipment have just been ordered from Allis-Chalmers for the Fall River Station No. 1 of the Pit River development of the Pacific Gas & Electric Company. These will be the largest water wheels in the West, although of the same size as three placed in the Niagara Falls development. The Pit River turbines will operate under a higher head, however, being 425 feet.

The remainder of the generator equipment consists of two 35,000-kva. water-wheel generators for 90 per cent lagging power factor, 3-phase, 60-cycle, 11,000 volts, 257 r.p.m., with direct-connected exciters, and one 225-kw. motor-generator set. All the generating equipment represents an investment of about $1,000,000. Delivery is promised to start in 9 months, ending in 11½ months.

Seven Westinghouse single-phase transformers have been ordered, 16,667 kva., oil insulated, water cooled, outdoor type, wound for 127,000 volts high tension and star-connected for 220,000 volts.

REGULATIONS GOVERNING APPLICATIONS FOR WATER POWER PERMITS

The Federal Water Power Commission has just completed rules and regulations governing the application for and granting of water power permits. There are ten regulations which cover the following heads: (1) Definition of terms, (2) general requirements for applications, (3) applications for preliminary permits, (4) applications for licenses—major projects, (5) applications for licenses—minor projects, (6) applications for licenses—major projects already constructed, (7) declaration of intention, (8) priorities and preferences, (9) permits, (10) licenses.

PROSPECT PLANT ADDITION OUTLINED BY CALIFORNIA-OREGON COMPANY

California-Oregon Power Company announces extensive additions to its present Prospect Plant on the upper Rogue River, Jackson county, Ore. Plans call for the construction of a concrete dam, one and one-half miles of canal and a forebay with a ten-acre surface area. A 3,000-ft. high-pressure pipe will conduct the water from this forebay to a new concrete and steel power house. Four units in the new plant will develop 20,000 kw. Financing of the project will be done probably by a bond issue early in 1921, following the reorganization plan recently outlined by the company.

NEW PUGET SOUND EIGHT PER CENT POWER ISSUE SELLS RAPIDLY

Five year 8 per cent gold coupon notes to the extent of $1,000,000, dated Sept. 1, 1920, have been placed on the market by the Puget Sound Power & Light Company, Seattle, Wash. These notes are the direct obligation of the company, and come ahead of the $14,793,000 of preferred stock and $20,112,000 of common stock. Offering is made in denominations of $100, $500 and $1000 at face value and accrued interest, and interest is payable the first of March and September.

By the morning of Sept. 16, $530,000 of the issue had been sold locally, expectations having been exceeded in all districts. It is expected that the sale will be limited shortly to a small number of shares per person in order that all may be satisfied. Time allowance has been given by the company for payment, but it is found that little advantage is taken of this feature.

For the twelve months ending July 31, 1920, the company states that it has earned, after deducting all operating costs, taxes and prior charges for interest on mortgage debt, $2,096,970. The outstanding capital of the company, with the new issue, will be $75,395,500. In the intention of the company to meet the increasing demands for power, it has been found necessary to make this new issue, the proceeds from the sale of which will stay in the Pacific Northwest.

TWO MORE WESTERN POWER APPLICATIONS FILED IN WASHINGTON

Six new applications for water power permits have been filed with the Federal Power Commission, and of this number two have been for developments in the West. The Priest Rapids Irrigation District has made application for a preliminary permit to develop power on the Priest Rapids of the Columbia River, filed under W. J. Kincaid of White Bluffs, Wash. This is the second application filed for Priest Rapids. The other Western one is by the Tongass Pulp & Paper Company, under M. M. Lyter, attorney, Alaska Building, Seattle, Wash., for a preliminary permit to use Fish Creek, Swan Creek, Big Lake, Mirror Lake and Swan Lake, in southeastern Alaska, for power purposes and authority to construct power plants, pulp and paper mills on Carroll inlet. A previous Alaskan application had been filed by the Speel River Power Company, 418 Foxcroft Building, San Francisco, for a site in the vicinity of the Speel River, in the Tongass National Forest.

It is interesting to note that the first applications for licenses to be advertised by the Federal Power Commission are those of the Ford Motor Company at Troy, N. Y., and of the state of Illinois for the use of the waters of the Des Plaines and Illinois Rivers.

P. G. & E. RUSHES NEW 60-KV. TIE LINE

In order to complete the tie-in before snow flies, the Pacific Gas & Electric Company is rushing work on its new 60,000-volt line from the Drum power house to the Colgate power house, above Nevada City, California. An appropriation of $250,000 has been made for the improvement, and a camp has been established near Birchville.

SOUTHERN CALIFORNIA EDISON COMPANY RATE CASE CONTINUED

In response to the date fixed by the Railroad Commission, the Southern California Edison Company made its appearance on Sept. 16 in the Los Angeles office of the Commission in the matter of establishing permanent electric rates, which is a continuation of the case in which a 27 per cent surcharge was imposed in order that the company might be saved from the great losses threatened by the water shortage of this spring.

Commenting on the company's progress for power development, R. H. Ballard stated that new hydroelectric plants aggregating 92,000 horsepower would become available during 1921; that these new plants would produce 350,000,000 kilowatt-hours annually, this being about the amount now carried by the company's steam plants; that the cost of these new installations with distributing lines was approximately $25,000,000 and that the average interest rate paid by the company for this money was 7½ per cent.

According to Mr. Ballard further immediate developments in the Big Creek country, in addition to the above, will call for a further expenditure of $45,000,000, this program including the 13-mile tunnel to connect Florence and Hunting-

ton lakes and improvements in the Shaver Lake district, where a reservoir of 146,000 acre-feet storage will be provided. This portion of the program will yield another 150,000 horsepower.

Some interesting figures on reproduction costs were presented by Arthur Kelley, valuation engineer. He stated that the actual cost of the Edison property amounted to $96,300,000 whereas the cost to reproduce the property on present day values, less depreciation, would be $128,731,000.

CONDITION OF PRELIMINARY WORK ON SKAGIT RIVER PROJECT

A recent survey of the work already done at the Skagit River power project in the state of Washington shows that work has been completed on the sawmill, which has a capacity of 20,000 ft. daily; two camps have been built, accommodating 200 men, and work is being rushed on the new railway extending from Rockport to Marblemount. All of the work is preliminary to actual construction work on the Gorge Creek power house and dam, which will be started early in the spring. If the first power unit is built in accordance with present plans, the cost of the unit, according to hydroelectric engineer C. F. Uhden, will be: with high dam, giving daily storage, 60,000-kva. installation and single transmission line, $11,000,000; with low dam, no daily storage, 60,000-kva. installation and single transmission line, $8,000,000; with low dam, no daily storage, 40,000-kva. installation and single transmission line, $7,000,000. The cost of the kilowatt-hours delivered on high tension at Seattle under the first plan would be 0.43 cents, under the second plan, 0.52 cents, and under the third plan, 0.45 cents. This price is said to be approximately one-half the present cost of current in Seattle. It is now stated by Mr. Uhden that, barring unforeseen delays, current will be available in Seattle from the Skagit plant in 1923. Expenditures up to June 21, 1921, are estimated at $1,832,820.

SKIP STOPS INSTITUTED IN SAN FRANCISCO TO SAVE POWER

That the curtailing of power through the cutting down of sign and display lighting is not sufficient in the present power shortage in California is evidenced by further regulations to effect an immediate reduction in power consumption in San Francisco. Beginning Sept. 20, street car companies in that city instituted a complete skip-stop system of operation similar to that in effect during the war. It is even considered that this saving will not be sufficient to meet the gravity of the situation, and that reduction in car service on many lines will be necessary. In certain down town districts street lighting has been cut down considerably.

PLANS READY FOR CITY OF SEATTLE'S CEDAR FALLS POWER HOUSE

The completion by the city architect of plans and specifications for the new Cedar Falls power house, designed to accommodate the necessary machinery to develop 20,000 hp. of additional power, marks the last step preparatory to beginning actual construction work of this much-needed unit, figured to cost $1,000,000.

The new concrete and steel structure will adjoin the present power house below the falls and is to house a Pelton overhung turbine, driving a Westinghouse generator. Transformers will be used to step the voltage up to 60,000 volts for transmission. This is the first unit of large size to be installed under the new system designed by superintendent J. D. Ross, by which the generating unit and the transformers are considered as an inseparable unit without intermediate switches and busses. This same system is to be used at the Lake Union steam plant.

In addition to the equipment to be installed in the power house, much outside work is to be done. On the intake side of the unit and joining the present 1600-ft. tunnel, there will be constructed 5305 ft. of wood stave pipe, 6 ft. 6 in. in diameter, and joining this, where the pressure becomes greater because of a fall in elevation, will be placed 2200 ft. of 6-ft. 6-in. steel pipe. These pipes will be placed above ground.

Following the approval of the plans by the board, no time will be lost in issuing calls for bids for the construction of the building and the other necessary work, incident to putting the unit in operation at the earliest possible moment.

P. G. & E. ASKS RATE INVESTIGATION

Pacific Gas & Electric Company on Sept. 21 filed with the California Railroad Commission an application for an investigation of the rates and fares charged by the company in the operation of its system of street railways in the city of Sacramento, Cal., and for an order establishing such rates and fares as will yield the company a fair and reasonable return upon the value of its street railway properties. The company claims for these properties a value in excess of $2,449,285. This is exclusive of franchise or going concern value and development costs.

The company says that during the fiscal year ending June 30, 1920, the gross revenue of the street railways in Sacramento amounted to $727,647.85. The operating expenses for the same period, according to the company, amounted to $596,073,81, leaving the sum of $131,574.04 available for depreciation and return.

COAST STATES HAVE RADIO SERVICE TO JAPAN

On Sept. 1, the Radio Corporation of America extended its Japanese radio-telegraph service from its former San Francisco district to the entire states of California, Oregon and Washington and to British Columbia. The rates for such service will be the radio rate of 72 cents a word between San Francisco and Japan plus the telegraph service of the Western Union from points outside of the San Francisco sending station. In addition the company is inaugurating a press service at one-half the straight radio rate. Marine radio service in and around San Francisco will be handled by the new marine station which the company is opening at Bolinas, just north of San Francisco.

POWER DEVELOPMENT PROJECTED ON LOGAN RIVER, UTAH

A project for the utilization of the flood waters of the Logan river, Logan, Utah, collected during the spring high waters, is contemplated within the next two years, to irrigate lands on the east side of Cache county and also to supply ample water for the operation of power plants that may be idle or operating with a short supply of water for part of the year.

This would involve the construction of a dam across the left-hand fork of Logan river, about twenty-one miles above Logan city. The dam would be about 210 feet high at this point, for the storage of about 35,000 acre-feet of water, and would cost about $2,500,000.

Preliminary steps are being taken toward the formation of an irrigation district covering the area affected, and all unappropriated waters of the Logan river have been withdrawn from entry by the state engineer for the next two years.

J. R. TOMLINSON, Pierce-Tomlinson Electric Company, Portland —

"The contractor-dealer has gone about as far as he can alone—as any one branch can develop without the others."

—Northwest Electric Light and Power Association.

P. G. & E. RENTS ALAMEDA MUNICIPAL PLANT TO HELP RELIEVE POWER SHORTAGE

The Pacific Gas & Electric Company has added 1500 kw. to its lines by by the starting up on Sept. 17 of the Municipal Electric Light plant in Alameda, Cal. An agreement has been reached whereby the Pacific company pays the costs of putting the Alameda plant into service and all costs of operation, and in addition pays a rental charge of $100 a day. This latter charge, however, may be reduced following a conference set down for the last of September. The Municipal company will operate the plant.

While this new service is not being applied directly to the Pacific company's lines, it is fed into the lines of the Great Western Power Company, and this company in turn releases an equivalent amount to the Pacific company at points where it is needed most. At present from 30,000 to 35,000 kw-hr. per day is being added to the lines.

The Municipal plant had been shut down for nearly two years, purchasing its power from the Great Western because of economies effected by that procedure, but was put back in operation for this new run in six days. Its operation under present conditions is only temporary, pending relief from the power shortage.

3,828,982,000 KW-HR. PRODUCED IN WEST DURING FIRST SIX MONTHS OF 1920

Figures on the production of electric power and consumption of fuel by public utility power plants in the Western states for the first six months of the present year have just been made public by the United States Geological Survey. Records are given for each state in the Union, but only those of the eleven Western states have been compiled in the summary given below.

Total production of public utility power plants for that period amounted to 21,846,515,000 kw-hr., which is at a yearly rate of 43,693,030,000 kw-hr. Figures for the first half of 1919 are given by the Survey as 18,779,250,000 kw-hr. Of the first amount, Western states listed in the table produced 3,828,982,000 kw-hr., or 17.5 per cent of the total for the country. One-fifth of this power was produced by fuels and the remainder by water power.

An interesting point comes to light in this connection in that 75 per cent of the power produced by wood as a fuel is produced in the West; that section generated 7,753,934 kw-hr. of energy by wood-burning for the six months through June out of a total in the country of 10,329,306 kw-hr. The West produced 37 per cent of the total energy produced by water and 5.65 per cent of that produced by fuels. It consumed 2 per cent of the coal that was required to produce public utility energy throughout the country, 11.6 per cent of the natural gas and 47 per cent of the petroleum and its derivatives.

The quantities in the table are based on national returns received from about 3,000 power plants of 100-kw. capacity or more engaged in public service, including central stations, electric railways and certain other plants which contribute to the public supply. The capacity of plants submitting reports of their operations is about 90 per cent of the capacity of all plants listed with the Geological Survey.

BASIS OF SEATTLE LIGHT WARRANTS RAISED

Seattle light department warrants have gone on a 6 per cent basis. They have been on a 5 per cent basis, but City Comptroller Harry W. Carroll states that the condition of the financial market at the present time makes the increase necessary. The banks of the city have advised the city council and light department that the present financial market requires a 6 per cent bearing warrant, and calls attention to the fact that the Government is issuing Treasury notes bearing 5¼ per cent, and commercial paper is drawing 8 per cent. The light fund is overdrawn at the present time, and will probably remain in that condition until March, 1921.

CONVENTION OF WATER POWER LEAGUE IN WASHINGTON, D. C., IN OCTOBER

In order to give the representatives of the various states interested in water power an opportunity to meet with the Federal Power Commission, the Water Power League of America has invited producers of water power, users and prospective users of water power, state officials and others interested in the subject to attend a convention in Washington, D. C., on Oct. 7 and 8.

Among the subjects to be discussed will be "Financing Under the Federal Power Act," "The Advantages of the Federal Power Act From the Standpoint of the Practical Developer and Operator" and "Cooperation Between the Power Producer and the Federal Power Commission." "What the Farmer Expects From Water-Power Development" will be discussed by a representative of the National Grange. In addition, O. C. Merrill, executive secretary of the Commission, will present the federal water power act, W. S. Murray will discuss the Eastern super-power zone survey, and related questions of drainage, forestation, etc., will be covered.

PRODUCTION OF ELECTRIC POWER AND CONSUMPTION OF FUEL BY PUBLIC UTILITY POWER PLANTS IN THE WEST FOR FIRST SIX MONTHS OF 1920

	THOUSANDS OF K. W. H. PRODUCED BY				Short Tons of Coal	Barrels of Petroleum and Derivatives	Thousands of Cubic Feet Natural Gas
	Water	Wood	Fuels	Water and Fuels			
Arizona	55,156		25,692	80,848	2,400	121,035	0
California	1,219,179	572.	527,900	1,747,079	0	2,738,852	1,164,943
Colorado	83,489		111,685	195,174	219,855	712	0
Idaho	292,614	50.	1,138	293,752	410	40	0
Montana	572,351		3,170	575,521	24,716	224	5,666
Nevada	18,446		4,851	23,297	1,395	8,069	0
New Mexico	403		6,478	6,881	21,176	2,639	0
Oregon	188,299	6,466.	43,183	231,482	1,783	9,050	0
Utah	93,669		56	93,725	138	0	0
Washington	537,537	664.	18,566	556,103	19,608	57,785	0
Wyoming	997		24,123	25,120	71,031	46,162	18,420
Total, West	3,062,140	7,753.	766,842	3,828,982	362,512	2,984,568	1,190,026
Total, U. S.	8,274,293	10,329.	13,572,222	21,846,515	18,785,851	6,361,701	10,258,673
Per Cent West to U. S.	37	75	5.65	17.5	2	47	11.6

WESTERN CITIES TO GUIDE MAIL-'PLANES BY WIRELESS ILLUMINATION

In connection with the obtaining of electric power from the Utah Power & Light Company for the operation of the radio station to be established in Salt Lake City, it was stated by Colonel John A. Jordan, superintendent of the Western division of the air mail service, that small electric lights operated by wireless placed on the front of the machines will guide the planes at night on the transcontinental air mail route between Cheyenne, Salt Lake City and San Francisco.

"The lights will be tuned to the wireless instruments of the three cities in such a manner that they will shine only when the planes are within a certain radio path about 200 feet in width. When a plane strays from this path the lights will go out and the pilot will be obliged to determine by the wind on which side of the route he is traveling. Approach to the destination will be signified by a flashing on and off of the lights. The process has proved a success in thorough tests and is owned by the government," said Colonel Jordan.

NEW MEXICO CENTRAL STATION TO SUBSTITUTE HOGGED FUEL FOR COAL

In substituting for coal in central stations, hogged fuel has just gained another step. The Albuquerque (N. M.) Gas & Electric Company is installing two additional boilers and conveying apparatus, at a cost of $50,000, to use hogged fuel obtained at a nearby sawmill and hogged at the station plant. Coal will be burned only when there is not sufficient sawmill refuse. Last year the 21,000-kva. station produced 3,800,000 kw-hr. with a consumption of 11,000 tons of coal, much of which it is expected will be saved by the changes.

REGIONAL WATER POWER OFFICE DESIRED BY NORTHWEST ENGINEERS

There is a good deal of agitation among engineers of the Northwest to have their own regional office to handle applications on behalf of the Water Power Commission and to perform other duties under the new federal water power act. It is held that Seattle or Portland are more logical cities in which to have regional headquarters than is San Francisco, from which city at present all such Pacific Coast business is handled. There is no desire in the Northwest to eliminate San Francisco as a center but to add a Northwest region.

California has only 49.4 horsepower of hydroelectric energy per square mile available, while Washington has 125 potential horsepower per square mile, Oregon has 68.4 and Idaho has 60.4 horsepower. At the same time no consideration is taken of Alaska with its large resources in hydroelectric energy. Seattle seems to be the logical center for Alaskan business if only cities in the States are considered.

BOULDER CANYON SITE PROPOSED FOR IRRIGATION AND POWER DEVELOPMENT

The building of a $20,000,000 dam in Boulder Canyon, with a capacity of 240,000,000 acre-feet of water, is comprised in a plan outlined by Arthur Powell Davis, director general of the United States Reclamation Service. The information comes from Governor Bamberger of Utah, on his return from the League of the Southwest conference in Denver.

Stored waters of Colorado tributaries would take in two areas of lands, and the dam would take care of 10,000,000 acre-feet of silt which is annually brought down the Colorado when the flood waters rush down. On the South Myton bench there could be placed under irrigation 65,000 acres with waters from the Duchesne basin and 240,000 acres of adjacent lands 27 miles north from Green River. About 290,000 hp. could be produced through water storage near Green River, while the power that could be taken from the Colorado has been estimated at 2,666,000 hp.

WIRING CODE FOR CITY OF SEATTLE REVISED

After several weeks' study by representatives of the Building department, the Seattle Electrical Sub-Contractors' Association, Journeymen Electricians, Building Owners and Managers' Association, and the Washington State Chapter of the American Institute of Architects, the electric wiring code for the city has been revised and has been referred to the Public Safety Committee of the City Council. The old wiring code now in effect was adopted in 1912, but was not presented to the council until two years later. Since then it has been revised in various ways. Most of the latest revisions relate to the details of wiring, requiring that they be in accordance with generally accepted standards. The following are among the more important changes:

The use of conduit instead of open wiring is required in more instances than is required in the existing code; that is, the existing code permits open wiring in frame apartment houses three stories high; these buildings are now required to have conduit.

Conduit and cabinets within 100 feet of salt water are required to be galvanized.

Exposed switches in panel boxes accessible to tenants are required to be protected by a safety device so that danger to life is obviated.

Eliminating open wiring on the roofs of new buildings in the first and second districts and on the roofs of other buildings in the first and second districts if dangerous.

It is believed that the economies balanced against the additional costs will show but slight addition in cost of installation and will add considerably to the safety and durability of the installation.

SOUTHERN CALIFORNIA EDISON ANNOUNCES FIFTEEN-YEAR PROGRAM

Announcement has been made by R. H. Ballard, vice-president of the Southern California Edison Company, of a fifteen-year program for that company, involving the expenditure of $200,000,000 in the development of 750,000 horsepower from the Kern and San Joaquin rivers, Big Creek and Huntington, Shaver and Florence lakes. The Kern River program calls for a 40,000 horsepower plant, the addition to the Big Creek plant is 22,000 horsepower and a new 30,000-horsepower plant is proposed on Big Creek for early next year. Mr. Ballard brought out the necessity of developing 50,000 horsepower additional energy each year to keep abreast of the estimated demands for service.

TACOMA COMMISSIONERS PROTEST REQUEST OF UTILITY TO REDUCE PROPERTY VALUATION

The city commissioners of Tacoma, Wash., recently protested before the State Board of Equalization the request of the Tacoma Railway & Power Company for a reduction of $1,000,000 in the valuation of its property within the city limits of Tacoma. It is the belief of the city officials that between $30,000 and $40,000 will be saved to the city on its tax income by the protest. Commissioner Fred Shoemaker, in discussing the company's request, says that if any change is made this year in the valuation of the company's property, it should be in the direction of an increase. "They offered to sell the property to the city of Tacoma for $6,500,000," he stated, "thereby setting a market valuation for their holdings, and the state public service commission in granting a 10-cent fare recently, calculated to allow the company an annual interest of 8 per cent on its investment. Actual assessment valuation on their property is $3,000,000, and in levying taxes the commission reduces that by half, leaving a tax levy on but $1,500,000. In my testimony before the Equalization Board, I tried to show that the average property owner of Tacoma is paying taxes on 50 per cent of the market value of his holdings." City officials believe the board will take favorable action in the matter.

D. E. HARRIS, vice-president and sales manager, Pacific States Electric Company —

"We must substitute self-interest for selfishness—a very different thing."

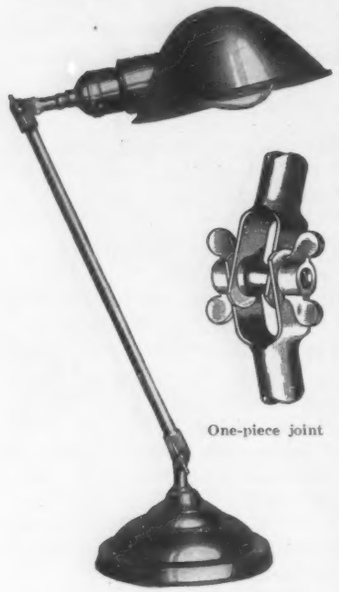
—Northwest Electric Light and Power Association.

LATEST IN EVERYTHING ELECTRICAL

(Nothing can be more convenient than a convenient lamp. That is why every improvement in this line is welcomed by electrical dealers and their customers. The portable lamp with the adjustable joint described here as well as the announcement of a new condulet body line especially designed to avoid kinking of heavy wires are of interest. Eight hundred and seventy copies of Mr. Kennedy's book, "Winning the Public," have been sold within a month and for that reason the review appearing on this page is of more than usual import.—The Editor.)

THE ADDITION OF AN ADJUSTABLE JOINT

The already convenient portable lamp has been improved by the addition of an adjustable joint at the base and at the upper end of the arm. The Faries Manufacturing Company, originators of the well known portable lamp, No. 1012, are responsible for this improvement.



One-piece joint

The portable lamp of the Faries Manufacturing Company as it appears with the new adjustable joint.

As may be seen in the illustration, the lamp is made in five pieces, the iron base with felt on the bottom, the heavy brass shell which covers the canopy and the three-piece stem made with a one-piece joint. The above illustration of the one-piece joint shows how the heavy tubing is split and straightened out, making the joint practically as substantial as the tube itself.

The arm of the portable is made in three pieces, the short arm at the socket end, the center stem, and the third piece fits into the iron base and swivels on the base. This swivel on the base in connection with the adjustable joints permits the light to be thrown in any position. The shade shown on the cut of the portable itself also swivels, so that the light may be adjusted to any angle.

NEW CONDULETS

To meet the demand for a condulet having an unusually long cover opening and big wiring chamber, the Crouse-Hinds Company of Syracuse, N. Y., have designed a new series known as the new Mogul Series of Condulets which are now being shown in their Bulletin No. 1000-N.

These condulets are designed to avoid kinking heavy wires or cables when pulling in or feeding through a conduit system, and to afford ample space for making splices or taps. Furthermore, these condulets though liberal in their proportions do not materially affect the general outline of the conduit system. Their hubs have integral bushings and tapered threads. Fastening screw holes are located at the ends of the cover openings.

Mogul Condulets are made in eight types, each type in eight conduit sizes ranging from one to four inches. There are four sizes of composition and cast iron covers, each size being common to two sizes of Mogul Condulet bodies. The composition covers are made with from one to nine wire holes; also blank, which can be drilled by the user as required. The cast iron covers are made in two types; with gasket, or without gasket. The gasket is made of round rubber cemented into a groove in the cover. The cover fastening screws are furnished with and secured to the cover.

Books and Bulletins

"WINNING THE PUBLIC"

By S. M. Kennedy, vice-president in charge of Public Relations and Business Development, Southern California Edison Company; 168 pp., 6 x 9 in. Published by the McGraw-Hill Book Company, Inc., 239 West 39th St., New York, and on sale by the Journal of Electricity, 531 Rialto Bldg., San Francisco. Price $2.50.

"The public be damned" is a dead policy, and nowhere is the broader policy of conciliation more clearly exemplified than in the practice of the modern utility concern. The good-will of its customers is looked upon by the progressive power company not merely as an eminently desirable adjunct, but as a definite business asset, and the subject of public relations now has a recognized place in the company's program.

This new spirit, in all its various aspects, is voiced in a remarkable way in Mr. Kennedy's unique book. Published as a series of articles in the Journal of Electricity recently, this work aroused the interest of the entire electrical industry and called forth expressions of approval from all over the country. The demand was so great that it was decided to issue the articles in book form, and the resulting volume, recently off the press, is one which should find a place with every business house, and especially with every public service company.

The subject is treated with a thoroughness which will make the book the standard work on this aspect of public utility development. Every avenue of contact between the company and its customers is covered—from telephone calls to advertising, from managerial interviews to meter reading.

The book is absorbing reading throughout, and is written with a human touch which drives home as nothing else could, the reality of the personal element in business.

Appraisals and Rate Making

This booklet, by Cecil F. Elmes of the Sanderson & Porter engineering staff, is a publication of the address under that title which was given before the fifteenth annual convention of the Illinois Gas Association.

Such questions as the following are adequately discussed: Why should rate making be different in the case of a thousand feet of gas from the same problem in regard to a bar of soap? What is the service which the public utility renders? On what basis are we to compute a fair return to the investor?

Sections are devoted to a discussion of the relation between prices of commodities and between commodity prices and wages as well as to the present purchasing power of money and rates and rate of return as judged by the purchasing power of money.

NEW ELECTRICAL DEVELOPMENTS

(Of the four districts represented on this page, four report some phase of dam construction. The Northwest also announces the installation of a large radio commercial station on Puget Sound while noteworthy financial and construction news comes from the Pacific Central District. The Southwest and Intermountain districts plan the construction of lighting plants and street lighting systems.—The Editor.)

THE PACIFIC NORTHWEST

BANDON, ORE.—A slight increase in the rates of the Bandon Power Company was recently granted in an order issued by the Oregon Public Service Commission. Figures submitted showed that the company, for the period of Jan. 1 to July 1, 1920, operated at a net loss of $4,456.16. The new rates became effective Sept. 1.

SPOKANE, WASH.—The Spokane & Eastern Light & Power Company recently announced wage increases, effective Sept. 1, amounting to $100,000 a year, affecting more than 500 employes in both the power and lighting and street railway divisions. It is stated the increase will add from $12.50 to $17.50 per month to the wages of every employe, except street car conductors and motormen.

SEATTLE, WASH.—The Board of Public Works has approved the plans of Architect Daniel Huntington for the new $60,000 addition to the Cedar Mills power house, and the structure will be contracted for without delay. The machinery, including turbines, transformers and generator will arrive in Seattle about December 20th, and it is intended to have the structure completed to receive them. All work aside from construction of the building will be done by day labor.

PORTLAND, ORE.—The Public Dock Commission has prepared plans and specifications for furnishing and installing all the mechanical equipment for the 15,000-ton floating drydock now under construction. This equipment included 10 single stage centrifugal pumps, 4 electrically operated capstans, flood gates, sluice gates, valves and stems. Bids will be called for the work, and also for ten 100-hp., 440-volt motors. The date for closing bids has not been fixed.

SEATTLE, WASH.—Announcement has been made by W. F. McAuliffe, local manager of the Radio Corporation of America, that his company plans the early installation of a radio commercial station, estimated to cost approximately $30,000, on Puget Sound, possibly within the city limits of Seattle. The station will be used for marine work. Mr. McAuliffe states that commercial stations similar to the one contemplated in Seattle will be established at all the principal ports of the Pacific Coast.

SALEM, ORE.—Application has been filed in the office of the state engineer for a permit to construct a reservoir and to appropriate water for power development on the south fork of the Coquille River, by M. J. Anderson of Portland, Ore. The development contemplates the construction of a reservoir for the storage of 18,700 acre-feet of water, a tunnel and pipe line approximately three miles long, and appropriation of 75 second-feet of water under a head of 1,556 feet, which will develop approximately 13,000 theoretical horsepower.

SALEM, ORE.—The Sacramento-Klamath Water, Land and Power Company, through Victor de Marais and Charles E. Watson, of Sacramento, has applied to the state engineer for permission to divert 4,000 sec.-ft. of water from Klamath River for irrigating 250,000 acres of land, for developing 150,000 hp. and for domestic supply. The amount represents the total flow of Klamath River yet unappropriated. Construction will include a dam of concrete, rock and timber, 30 ft. high and 300 to 400 ft. in length, headgate and power plant at Cantera, California. Work is to be started within 60 days after permit is granted; total cost estimated at $15,000,000.

THE PACIFIC CENTRAL DISTRICT

ROSEVILLE, CAL.—Engineers are surveying a site for a dam to form a reservoir in the hills east of this city to hold sufficient water for the irrigation of 12,000 acres of land near Roseville.

EUREKA, CAL.—The indications now are that the Western States Gas and Electric Company soon will be getting its power from a source considerably nearer and much handier than that of Junction City on the Trinity river. The proposed new power site is located on the Klamath river, five miles below Martin's Ferry.

ORLAND, CAL.—Various plans were discussed at length for improving the water supply of the project at the meeting of the West Side Water Users' Club at the Murdock school. Among the plans suggested were the installation of four wells and pumping plants along the main canals just west of town, using the storage water for the lands to the west of town and the water supplied by the pumps for the land to the east of town.

RICHMOND, CAL.—The new paint factory of the Certain-Teed Products Company in this city has commenced operation of grinding and has added another industry to the city. The plant was constructed as a special unit at an expenditure of more than $200,000, and is said to be one of the most modern in America as the company profited by its experience with its plants in various parts of the country. The local factory will supply the Pacific Coast and Oriental trade.

SAN FRANCISCO, CAL.—An order issued by the Railroad Commission gives the Pacific Telephone & Telegraph Company and all other telephone companies operating in the state authority to retain funds collected from subscribers for installation and extension charges. In granting the request after an investigation as to the costs of installation, etc., the Commission says that moneys collected as installation charges from subscribers between August 1, 1919, to August 1, 1920, must be returned but that charges collected after August 1 of this year may be retained by the company.

GRASS VALLEY, CAL.—The Delhi Mining Company, owner of the noted Delhi mine in the Columbia Hill section, is installing a hydroelectric plant for the purpose of utilizing surplus water rights. Water will be taken from Bloody Run and other streams and passed through a penstock at a point where there is a heavy fall. Two generators of electric energy are to be installed in connection with a standard hydroelectric plant. It is stated that the company has contracted to supply 1000 kilowatts of electric energy to the Pacific Gas & Electric Company, beginning the first of next June. Harry Skewes of Grass Valley is superintendent of the Delhi.

SAN FRANCISCO, CAL.—The comparative statement of earnings of Mount Whitney Power and Electric Company for the half-years ended June 30, 1920, and June 30, 1919, was made public recently by Blyth, Witter & Co. It shows that earnings available for bond interest amounted to 3.3 times the requirements, and an increase of 32 per cent over the first half year of 1919. Balance, after interest charges, showed an increase of 54 per cent. Announcement was made to the effect that the time limit of the certificate issued by the State Banking Commissioner making the 6 per cent bonds of this company a legal investment for savings banks in California has been extended to March 31, 1921.

THE PACIFIC SOUTHWEST

SAN PEDRO, CAL.—A decision has been unanimously made that a bond issue be called for $300,000 to be voted on for the new electric line at Wilmington.

LOS ANGELES, CAL.—The first contract for Big San Dimas Dam, to cost about $369,000, has been let to Dent Bros. after bonds had been sold to the extent of $200,000 to R. H. Moulton & Co.

LOS ANGELES, CAL.—Neptune Meter Company has been awarded a contract for furnishing the bureau of light and power 6,600 meters, and James Jones Company a contract for furnishing 13,600 bronze water meter connections.

ARLINGTON, CAL.—C. Ramschel of the Southern Sierras Power Company suggests a plan for taking care of the shortage of irrigation water in the Perris district by installing a series of pumping plants east of the artesian belt in the Lakeview section to pump water into a canal and permit its flow by gravity into Perris Valley. The matter is being considered by a committee of the Chamber of Commerce.

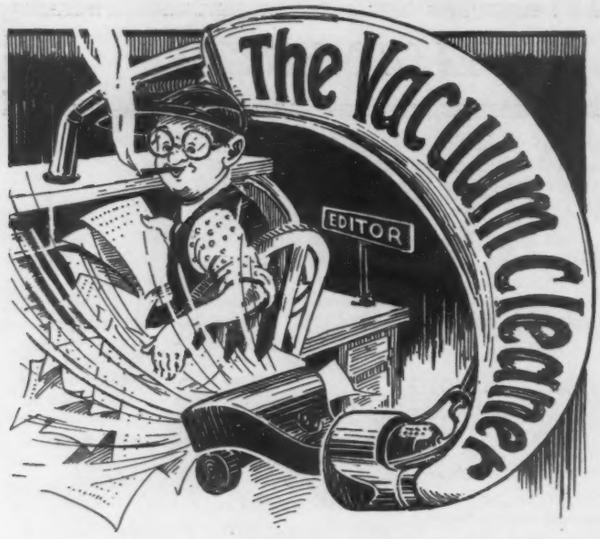
THE INTER-MOUNTAIN DISTRICT

JULESBURG, COLO.—The electric light and power line connecting the town of Big Springs with the light and power plant of Julesburg has been completed.

ROUNDUP, MONT.—The city plans the construction of an ornamental light system along the streets which are being paved, at a cost of $25,000. A special improvement district for installation of the lighting system was created some months ago.

MORGAN, UTAH.—The public utilities commission of Utah has granted a certificate of convenience and necessity to the Utah Power & Light Company through the city of Morgan to serve proposed customers beyond the city from the present power lines.

MALTA, IDAHO.—At a general mass meeting held at Malta recently, the developments possible in the great Raft River Valley were discussed. With an unlimited supply of underground water immediately available by pumping an average of 14 to 20 feet, the question of raising sugar beets by means of electric pumping for irrigation was discussed. Some information was also given by a representative of the Burley Electric Company relative to electrical energy for the valley. It was asserted that power is available if a means of financing the construction of a line could be had. A committee was appointed to investigate, and as soon as they report their findings steps will be taken toward pushing to successful completion the work begun.



To simplify transportation, the following changes in the routing of cars have been announced by the Tokyo Municipality Electric Bureau: "Schio-cho, Yotsuya to Sengakuji and Furukawa-bashi to Sengakuji lines to be abolished and the Shio-cho to Sengakuji and Tengenji-bashi to Kanasugi-bashi lines to be operated."

Very much simpler.

Everybody is quoting the following, so we may as well do it at once and get it over:

"Getting out a newspaper or monthly publication is no picnic. If we print jokes, folks say we are silly—if we don't they say we are too serious. If we publish original matter they say we lack variety—if we publish things from other papers, they say we are too lazy to write. If we don't go to church we are heathens—if we go we are hypocrites. If we stay in the office we ought to be out rustling news—if we rustle for news we are not attending to business at the office. If we wear old clothes we are slovens—if we wear new clothes they are not paid for. What in thunderation is a poor editor to do, anyhow? Like as not someone will say we swiped this from an exchange. So we did!"

* * *

"Music for the masses" is all very well as a slogan, but when it comes to someone getting delirious and inserting in a foreign trade magazine

"American importers are interested in an unlimited quantity of harmonicas"

—well, we are for rigorous import duties on luxuries.

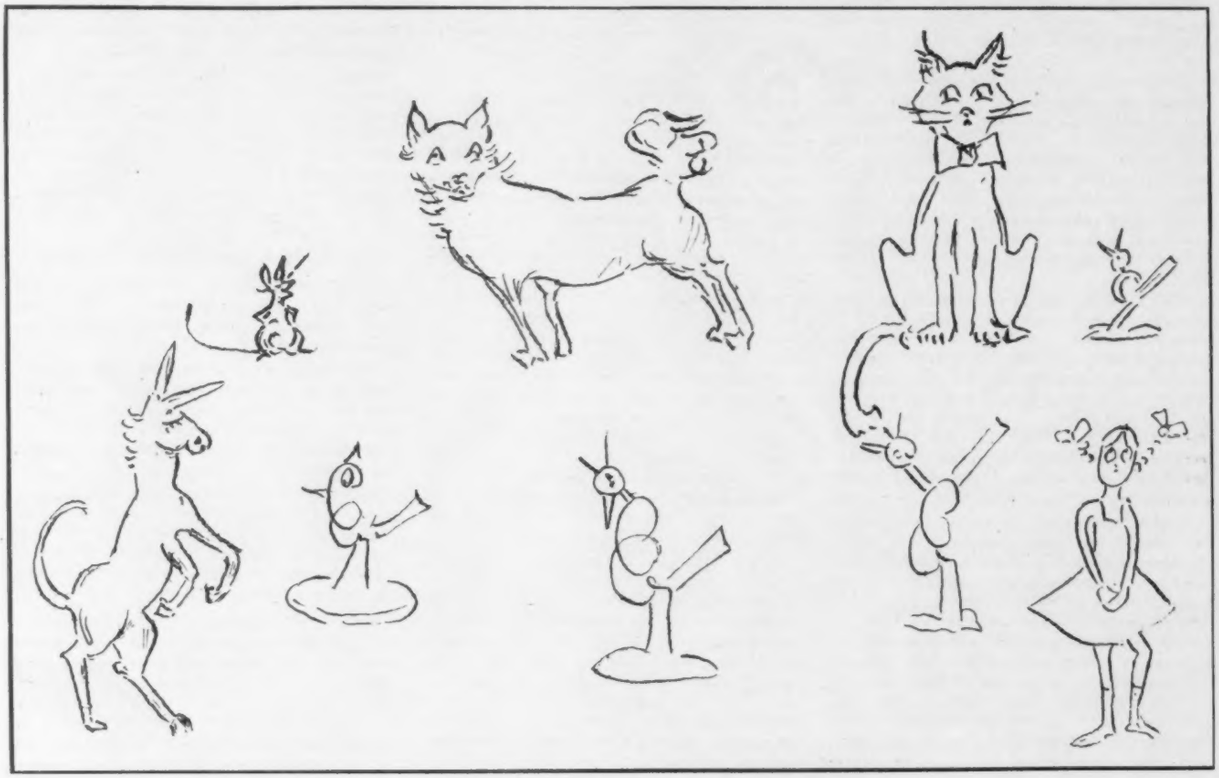
* * *

Hustle isn't an exclusive characteristic of New York, apparently. A plaintive item in the Western Electric News reads as follows:

What Is the Wild West Saying?

"Rush our shipment——."
"Urgent; wire answer——."
"Please observe schedule——."
"Trace shipment——."
"Wanted urgently——."

If we took our favorite florist's advice and "said it with flowers," there wouldn't be any poison oak left in California.



ECHOES OF THE CONVENTION

At first sight these don't seem to have very much to do with the Spokane convention, but they happen to be bona fide reproductions from the notebook of a reporter. The association of ideas is somewhat difficult to follow, and we are not good at psycho-analysis, but the expression of the cat at the right was probably seen on the face of a delegate watching a spider crawl round his neighbor's collar. The sketch in the lower left-hand corner seems to be some heraldic device—a donkey-engine rampant on a magnetic field, perhaps. The inspired lady at the right is somewhat difficult to tie-in with anything the reporter could have seen during convention, but may typify the expression of a speaker trying to look unconscious while the chairman introduces him.